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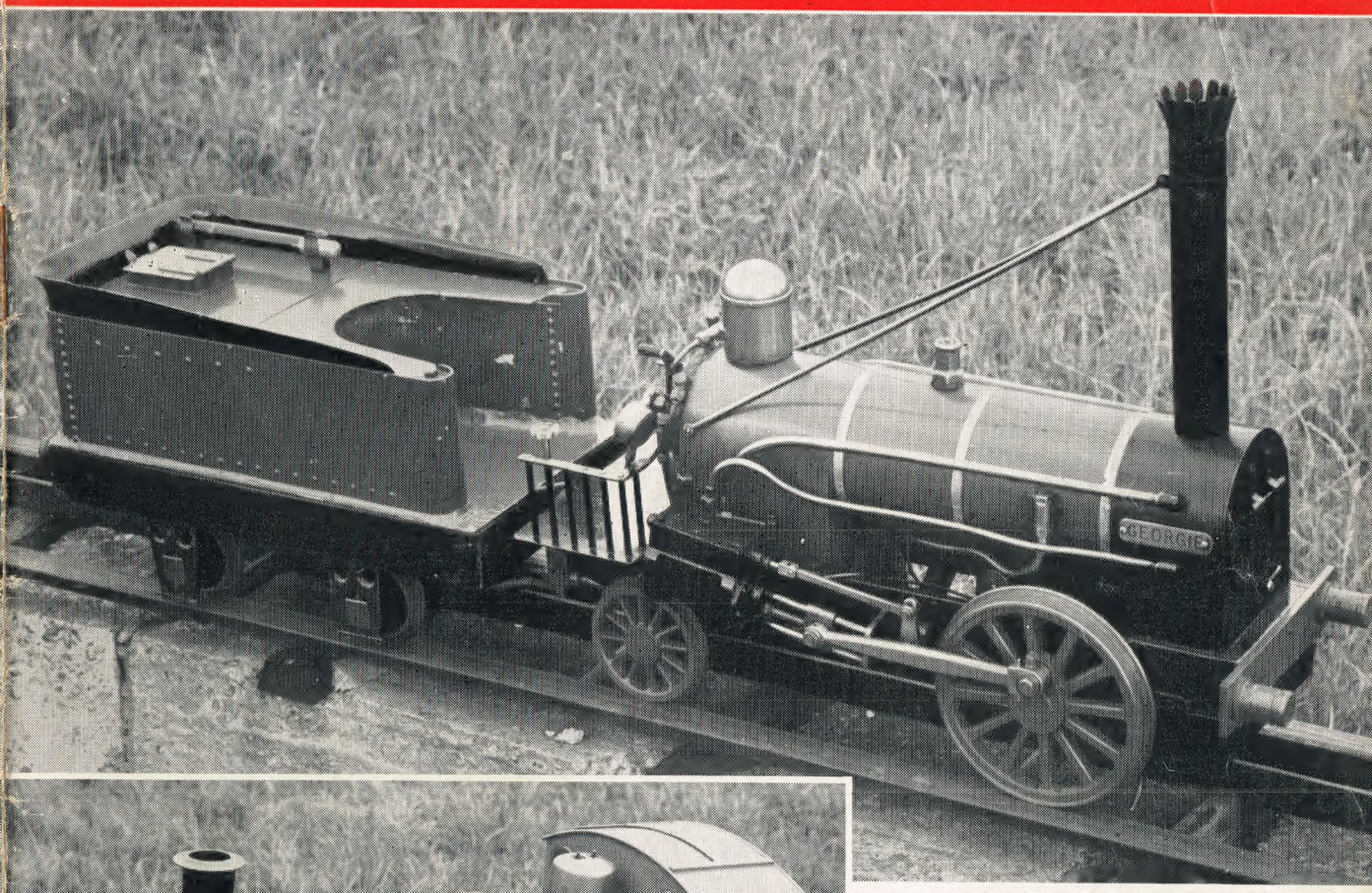

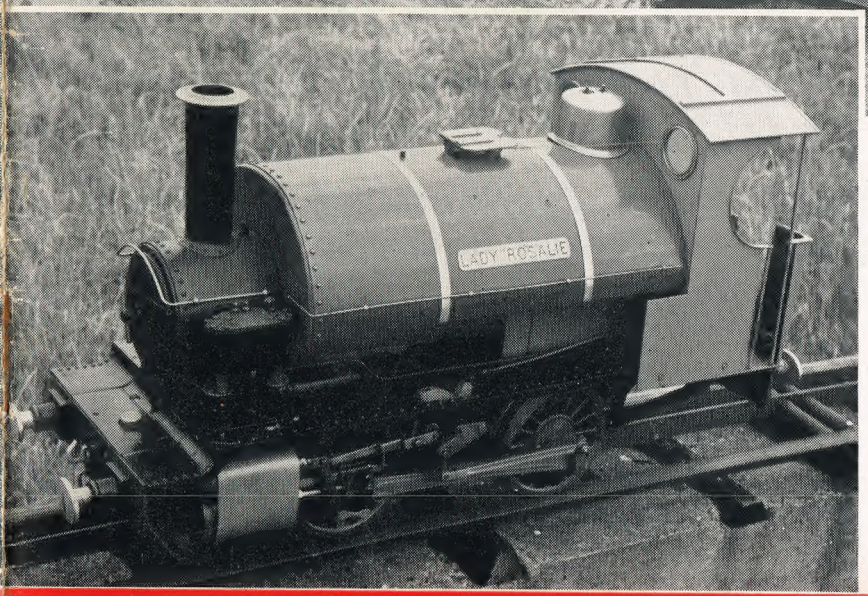

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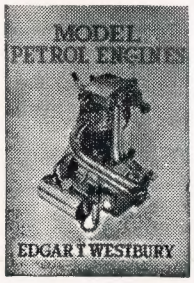

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Smoke Rings

A WEEKLY COMMENTARY BY VULCAN

IT is a proud boast of the House of Percival Marshall that its sole function is not to raise money; its aim is to provide a service of information to the model engineer movement through the magazines, books and plans which it publishes.

But this is not all; interwoven with its publications is a first-class query service dealing with the countless problems which arise in the many departments of model engineering. Some of the replies which our technical editors send to querists appear in Percival Marshall magazines, but the great majority, and it is a considerable number, are private letters which never reach the distinction of print.

This service entails an enormous amount of work—don't think we don't like it—but there are physical and financial limitations on what we can achieve.

Heavy expenses

To keep the service within well-defined channels we have for some time insisted on each query being accompanied by the query coupon which is printed on the last page of each issue of MODEL ENGINEER.

Moreover, to help us meet the considerable expenses of running this service, we ask querists to enclose a stamped addressed envelope. There are, unfortunately, some who do not but hitherto we have refrained from, differentiating, believing that the omission was probably an oversight.

But with the increased cost of postage from October onwards it is no longer possible to bear the brunt of some querists' forgetfulness and we must, with regret, say that we cannot answer questions, whether directed to our technical staff or to authors, unless they are accompanied by a stamped addressed envelope.

The LNWR Jubilees

SOME discussion has been aroused by the fact that the recently-published drawings of this class—Mr Maskelyne's on July 25 and Mr Keiller's on September 5—show slight variations of detail. The question is: how this can come about if both drawings were made from the same official original general arrangement.

For example, Mr Maskelyne has shown a capuchon on the chimney, but Mr Keiller has omitted it, and this seems to require some explanation. J.N.M. tells me that his drawing, while based on the official g.a., included some slight differences which, not only does he remember as visible on the actual engine, *Temeraire*, when he knew her, but are also to be seen in a photograph of her that he possesses.

He says that the capuchon was an ugly one, 3¾ in. high, and was worn by several of the Jubilee class, among others, *circa* 1911-1920. He also says

Smoke Rings . . .

that *Temeraire* was one of the very few LNWR passenger engines that were painted in the standard style and fully lined out, but had no coat-of-arms on the driving splasher, a phenomenon that helps to date the photograph referred to.

Little details like this not only exasperate the locomotive draughtsman and historian, but pin-point the necessity for the model maker to work to photographs if a correct result is to be achieved.

Visitors' book

WE hope that the Russians who visited the Model Engineer Exhibition had a pleasant trip home and arrived safely with their models. For all of them it was a long journey.

There can be no doubt at all that the Russian models were greatly enjoyed by the public. Placed beside the ships was a book in which visitors were invited to give their comments. "Really wonderful," a Cambridge tribute, summed up the general response. "We must look to our laurels," wrote someone else.

One visitor made his entry in Russian; a little surprise for Mr Bliznakov, whatever it meant !

Realism

While the public values craftsmanship for its own sake—and he would be poor of soul who did not appreciate the ivory models by Djalal Yusopov—it is a comfort rather than a disappointment to learn from the interview in these pages that the average Russian modeller prefers to build in natural materials.

The Soviet aim is fidelity to the original. When I asked Mr Bliznakov what had most struck him at the Exhibition, he said: "The realism of your models."

This quality he particularly liked in the historical models and other models and in others which derived a special interest from their associations. Like most intelligent modellers in England, the Russians view their work through the context of the original—its use and history and its place in the world. For them *Victory* was above all the ship which Nelson commanded in the war with Napoleon.

Their own models possessed this interest. On one hand we saw the atomic-powered *Lenin*, modelled before the full-sized ship was ready for launching, and on the other we had the sloop *Peaceful* in which Belentsgausen and Lazarev explored the Antarctic in 1820. In *Peaceful*, too, the historical and the topical met—for the Soviet, as we know, is aware of the new worlds that lie open at the Poles.

Lincoln red ?

For myself, I was impressed by the cultural attainments of our visitors. We expected them to speak with reverence of Shakespeare and Shaw, and perhaps it should not have surprised us when they declared an affection for Robin Hood ! Bold Robin and Long John Silver are apparently as well known in Russia as the face of Vivien Leigh.

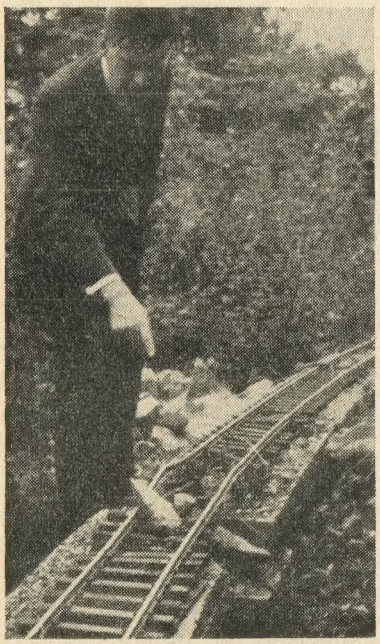
But here were men in ordinary occupations who spoke a different language from ourselves and yet were obviously better acquainted with our literature than many of our own people. Perhaps "We should look to our laurels" in more ways than one.

Timber !

IF the Russians come to the ME Exhibition again next year, and I hope they do, perhaps they will bring a model of a new tip-barge just completed in the Tyumen yards in Siberia. The barge has special ballast holds along one side which, when flooded sink that side into the water and raise the "lighter" side in the air, sliding 1,900 tons of timber into the water in 28 minutes.

The original idea on which the experts based their design was worked out by N. A. Lukovitsky, a Siberian river skipper.

The barge, if built to an appropriate scale, conjures up the intriguing picture of thousands of spent matches being jettisoned into the local pond—no doubt in the scale-time equivalent of 28 minutes !



The damage caused by lightning to the 5 in. gauge garden railway owned by Mr Harper, of Bromley

Cover picture

Two of the 5 in. gauge locomotives which A. H. Castle has built for arduous operation on his club's track. On pages 442 to 444 Mr Castle tells of the fourteen years' spare time labour which has produced four robust locomotives.

Track struck

HAVE you earthed your garden railway track ? If not, get busy on the job right away, lest you suffer the same fate as Walter W. Harper, of Bromley, for during a violent thunderstorm this summer lightning struck a section of his 5 in. gauge open-air railway, causing considerable damage.

Several of the 4 in. concrete slabs supporting the line were dislodged, one of them being completely smashed and part of it hurled 50 ft. Following the course of the metal lines the lightning travelled along the track in both directions breaking up and disintegrating wooden sleepers, melting the rail spikes and casting up ballast at frequent intervals.

But it reserved its lethal attack for the workshop. Mr Harper's line enters his workroom through a main wall—and the lightning did likewise, with ruinous results to the electrical gear.

Loco saved

A heavy iron fusebox was reduced to smithereens and the building was set alight, a great deal of damage being done to the contents. Fortunately, one of Mr Harper's 5 in. gauge locomotives, though standing on a part of the line damaged by the lightning, was unscathed.

Local fire officers thought that the lightning was attracted by a nearby tree, and not the rail itself, but they suggested, in the interests of safety, that the track should be earthed with stout cable at frequent intervals.

The Russians are to model the Victory

Model engineering in Russia is, as we would expect, an organised activity—but there are still many lone wolves on the steppes. JOSEPH MARTIN and ERIC WINTER interview the four Russians who submitted models to this year's Model Engineer Exhibition

NOTHING about the visit of the four Russians to this year's Model Engineer Exhibition has surprised us so much as the discovery that they intended to surprise us ! Confronted with ship models wrought in ivory, we began to wonder if the old legend from the first world war should be revised.

Surely it was not snow but ivory dust which those more clandestine Russian visitors wore on their boots when they " passed through England " in 1918 ? But now we learn from Mr Alexander Bliznakov, who led the delegation as director of the Central Marine Club in Moscow, that the Russian models were not typical. " We believed that they would cause comment," he said, " and we were not disappointed."

With this revelation, everything that I might have said about the Russian genius for the exquisite—in ship modelling as in the ballet and the delicate short stories of Chekhov—is, alas, no longer especially relevant. I even have to forget my prized quotation from Lenin—" The day will come when we shall use gold for building public lavatories in the great cities of the world." Gold, platinum and rubies are not just lying about in the Russian modellers' workshops as we might have supposed !

We did not expect the Russians to follow the same practices as ourselves, and part of the interest of their visit lay in the anticipation of differences.

One difference, not so much anticipated as known, was the element of system which unites and governs the modelling movement of the USSR. As many readers were aware from an article in MODEL ENGINEER of March 8 last year, modelling in the Soviet Union is consciously organised, like much else.

The four members of the Russian delegation with MODEL ENGINEER *staff. Alexander Vicherov, Alexander Veselovski and Djalal Yusupov are standing together, centre: Alexander Bliznakov is extreme right. In the background are Edgar T. Westbury (second from left) and J. N. Maskelyne (wearing spectacles) and J. Kreps*

What form does the organisation take ? This was the first in a list of questions which I prepared for Mr Bliznakov and his comrades before they left again for Prague and home on the last morning of the Exhibition. The questions were put to Mr Bliznakov by my friend Eric Winter, a keen student of life in the USSR and in particular of Russian folk songs. Although I felt the questionnaire to be rather formidable, the four gave their replies with the greatest possible courtesy and eagerness. This is what they had to say:

Q. Can you tell us something about how model engineering is organised in the USSR ?

A. There are only 200 or so Marine Clubs (ship modelling clubs) in the Soviet Union, but there are about 3,000 Technical Circles for young people aged, say, 15 to 30, which provide practical experience as well as discussion. Each club has its own workshop with hand tools and some power tools, lathes and machines. Of course, equipment varies widely and some circles are more fortunate than others in this respect.

A great deal of help comes to these clubs and circles from the Soviet Trade Unions who will " adopt " a club and give its members presents of materials, and especially tools—even power-driven tools and machines. This help comes spontaneously from the trade union members concerned.

Are the modellers all young ? *Is the modelling movement an offshoot of the Youth Movement in the Soviet Union* ?

No, not at all. Model workers are drawn from all walks of life and are of all ages. So keen are the young people, however, that many of our model shops are a part of the chain of shops which goes by the title

Pioneer—so-called after our movement for young people between the ages of nine to fifteen.

In the USSR we need a very large number of technicians to exploit the natural resources of our vast country, as yet hardly touched. So the Soviet Government has instituted a large-scale movement for technical education and recognises that modelling plays a tremendous part in arousing the interest of young people and making them technical-minded. In this respect, the government is specially prepared to give a good background for keen modellers by providing them with a sound technical education. In the end this means that they will become better modellers.

What attempts are made to cater for the modelling movement? Are there special shops at which the modellers can buy their materials?

Yes. In all the big cities there are shops with special counters devoted to modelling materials and tools. Many of these shops are, as already mentioned, of the Pioneer chain. The largest caterer for modelling enthusiasts in Moscow, for instance, is the Pioneer Shop No 1 in Gorki Street; it is a technician's shop with a special department for modelling equipment. There are three or four such shops in Moscow alone, and all over the Union there are similar facilities.

While in England, we have learned your expression "lone wolf" and we like it. Because the Soviet Union is a vast country we have many people who are obliged to become lone wolves—separated by a great distance from the nearest club or fellow-modeller. For all modellers, but for these especially, the Central Marine Club in Moscow runs an advice service and a plans service. It answers modellers' queries, arranges for consultations where necessary, and publishes a catalogue of plans and drawings available for a small sum. These plans may also be consulted freely in technical and school libraries and model clubs.

Home workshops

What methods of work do your modellers adopt? Do they work mostly at home or in the clubs?

I understand that in England beginners tend to spend more time in the clubs and that advanced modellers tend to specialise to some extent. As they gain experience they build a small workshop or even use the kitchen table. It is exactly the same with us.

Beginners find that the help and advice of experienced modellers give them confidence. Older modellers with experience behind them go away secretly on occasion. They return with the finished model, only too ready to receive approval and criticism from their colleagues. But they like to surprise their friends with the result of their work.

I understand that you have no magazine equivalent to MODEL ENGINEER. *Do you get articles on modelling in other journals?*

Yes. Particularly in *Teknika Molodyodzi* (*Mechanics of Youth*), *Yuni Teknik* (*Young Technician*) and *Znanie Sila* (*Knowledge is Power*). They also appear from time to time in *Pioneeri Pravda* (*Pioneer's Pravda*) and *Komsomolskya Pravda* (*Young Communist Pravda*), the organ of the Young Communist League of the USSR. Besides this there is, as I have said, the comprehensive plans service of the Central Marine Club.

Exhibitions

How about your model engineering exhibitions? And do you have exhibitors from other countries?

As in England, the clubs—even the smallest—hold club exhibitions. Competitions are held in city districts (the equivalent of your metropolitan boroughs), and then in cities, in the regions (counties) of each republic, and finally in Moscow where we have the All-Union Exhibition.

From the city exhibitions upwards, it is necessary to win your place in the next above by getting a prize at the lower level. Most entries are team entries from clubs, schools and colleges. Awards similar to your ME championship cups are given to teams to hold for one year. Individual prizes are usually in the form of watches, instruments, tools, cameras and so on, which are, of course, won outright.

International exhibits are not usually shown, but last year, for example, East German modellers held an international show to which we were invited, and next year we are organising a similar exhibition in Moscow in which, among many other countries taking part, will be the East German modellers. I hope that British modellers will come also.

Regattas

Are there regattas for ship models? Do you have radio-control and, if so, can the modellers buy commercial sets as in this country? Over here the radio-control of yachts is becoming increasingly popular as an exciting sport.

The regattas we hold are quite frequent because they are an inseparable part of the exhibitions already disucssed. In each exhibition we talk about the "table models" and the "water models," and we take great pleasure in seeing the water models race in the various classes of the regattas.

Radio-control is becoming very popular in the Soviet Union. If some years ago radio-control was practised only by, as you say, lone wolves, today it has scores of enthusiasts and at our regattas you will see special classes for radio-control racing of power boats and yachts. In the USSR, however, radio-control units are built by enthusiasts and cannot be bought prefabricated in the shops.

Can you give me a brief account of the history of modelling in the USSR? I believe that Russian modelling goes back to Peter the Great in the 17th century.

Although our ship modelling began in the time of Peter the First, it was not in any sense organised until about 1937-38. Until 1941 it made rapid strides, and clubs, competitions and exhibitions were arranged everywhere. After the second world war it was not possible to revive the movement until 1947-48, but, of course, it is now firmly established.

For over thirty years there have been enthusiastic aero-modellers in the Soviet Union. Model aircraft is the most flourishing branch of the movement, with ships a good second. Model cars, in third place, have been added in only the past three or four years and are, therefore, just beginning.

We are not enthusiastic for model locomotives, and model railways are a very poor fourth—not at all organised but carried on by individuals. This is also reflected in the fact that our children's trains are merely toys. We do not produce the splendid correct-in-detail toy trains for which you are renowned in England.

Those ivory models

We have been greatly impressed by your ivory ship models. Is ivory a traditional modelling material in the Soviet Union?

No. These models are not typical. When we were invited to come to England we did not know what to expect in the world of models, and so we did not know what to bring. We were very curious to know how you would react to our models, and so we tried to give reasonable variety in our exhibits.

Thus, although the ivory models of Djalal Yusupov are not in a traditional material, we believed that they would cause comment, and we were not disappointed. Yusupov is one of the very few people who work in ivory—indeed, he is the premier ivory modeller of the USSR—and his work has aroused a good deal of interest in England.

How did Yusupov get his ivory? Here it would be very expensive.

It is possible to buy ivory in the Soviet Union but it is expensive there also. Because Yusupov wanted to model in ivory he asked among his friends until he found some. It is elephant's ivory.

However, as in England so with us, the best models are made from the commonest and most appropriate materials. A deck should be made of wood, a hull of wood or iron or tinplate. We set great store by realism, a point that we have in common with British modellers. Of course, models made in this way take the best prizes.

Thank you for your kindness and patience in dealing with my questions. Tell me, what do you think of the British models at the Exhibition?

I have already made a statement on your British radio and I will give you a copy of it. We hope that you will visit us with British models and take a critical interest in our work. The most popular models with us are the historical—ships which have taken part in explorations, sea battles, expeditions and revolutionary actions.

Perhaps that will seem strange to you. Many people think of the USSR as a large mass of land. This is a misconception. The Soviet Union has thirteen different seas and 28,000 miles of coastline.

A large number of our people are connected with ships. Large sections of our population are concentrated in coastal areas and many of them are concerned with the sea, shipbuilding, fishing and other maritime activities. That is why ship modelling enjoys such great popularity in our country.

Thank you, again, Mr Bliznakov, for answering all these questions so clearly. You have told us just what we wanted to know.

I was with Mr Bliznakov when he spoke in the BBC Home Service programme devoted to the Exhibition. This is what listeners heard him say on that Saturday morning:

"We have already spent five days in London and are very pleased with the hospitality of the British people and especially with the reception we were given at this Exhibition.

"What produced a good impression on us is the fact that the objective and impartial judges' opinion is shared by the visitors and the model engineers.

"We hope that the British and the Soviet model engineers will do their best to strengthen and develop contacts in future. We support the idea of organising regular mutual exhibitions between the British and Soviet model engineers.

"The exhibition produced a very good impression on us. I want to emphasise the following characteristic features of the British models. They are: realism, the use of plain materials, and simplicity in construction. These features provide favourable conditions for a great number of enthusiasts in making their models. As regards the British models, most of all I liked the models of historic sailing vessels and especially those which are connected with life of the British people in various historical periods."

It was a very handsome cup, indeed, that the Russians brought with them and we were pleased that they should take one back. Alexander Vicherov, of Nicholaev, whose delightful Ukrainian shirt was much admired by the girls, had the immediate congratulations of Alexander Bliznakov, Alexander Veselovski and Djalal Yusupov —the only one of the four who did not bear a Christian name belonging to three Czars!

Far off in Russia the other ship modellers represented, Mikhail Chernakov, Arkadi Ushakov and Sergei Yuriev in Leningrad and Nicholai Kaminski in Odessa, were no doubt waiting eagerly for news—news that was carried from the hall at Westminster to the 90,000 ship modellers in the clubs and the lone wolves on the steppes, those unorganised individuals working away at their kitchen tables (with the samovar steaming close at hand like a single-tube boiler) in little communities which seem as remote to the crowds in Moscow as they do to us in England.

Trip to Portsmouth

High above Trafalgar Square stands a sailor who helped to save Russia as well as England from the domination of a tyrant. It was, therefore, not surprising that the Russians should go down to Portsmouth for a look at Nelson's *Victory*. They immediately decided to model her in wood—which set their interpreter the pretty problem of translating *teak*, a word which seldom intrudes itself into Embassy conversations!

Another obvious objective of Mr Bliznakov's party was Greenwich, where, with the National Maritime Museum and the *Cutty Sark* within a short walk of each other, they could have been happy for a week. They also went to the British Museum, in whose scholarly silence Karl Marx stirred the winds for a wild October; and only time prevented them from making a trip into Hertfordshire to the home of Bernard Shaw.

As Mr Bliznakov explained to me, they were torn between their special interests as modellers and their general interest in England. When I asked him what he thought of our capital he replied: "It is a great thing to be in the city of Charles Dickens. We all read Dickens in Russia and through him we all have a warm feeling for London. Dickens, Shakespeare, Shaw, Robert Louis Stevenson, Oscar Wilde, Byron, Thackeray, John Galsworthy—no one who knows these writers as we know them can ever feel really a stranger in England."

And, I may add, no one is ever a stranger, no matter from what country he may come, when he brings a model to the Model Engineer Exhibition. ■

J. N. Maskelyne presenting the Championship Cup to Alexander Bliznakov, the leader of the delegation

AT THE ME EXHIBITION

TRACTION ENGINES

J. N. MASKELYNE finds this an "off" year for road locomotives

THE year 1957 will have to be regarded as an "off" year, so far as traction engine models are concerned; for there were only two in the Competition section, and four that I noted that were not in that section. But to these may be added an i.c. road roller which was, of course, among the "Mechanically-Propelled Road Vehicles" in Class L.

The two competition models were really violently contrasted; the better one, by far, was the delightful 1½ in. scale single-crank compound Burrell Devonshire engine made by E. Hinchliffe, of Rochdale. It was a real gem, so neat, so simple and, above all, so true to the prototype. The workmanship was excellent, though perhaps not quite in the top class; but the moving parts, when tested by hand, worked smoothly, no "high spots" being discernible in any detail. The gear change was satisfactory and the link motion was well fitted, quite accurate in detail and without any detectable sloppiness.

The painting had been well done, and somehow had just the right amount of gloss in it. The lining was neat, without any unnecessary elaboration, and enhanced rather than spoiled the general effect of the whole engine. It fully deserved the bronze medal awarded to it, and it also won the Aveling-Barford trophy for the best model traction engine, road roller or steam wagon.

The freelance road locomotive by D. S. MacLellan, of London, NW5, was, frankly, disappointing. It was described by the builder as a "freelance copy of a Marshall roller," a rather puzzling description, since it is difficult to decide just how a roller can be made to look like a road locomotive, or vice versa. To complicate matters still more, the model had been got up to look like a showman's engine, and the result was that it was none of these things.

Its general proportions were well wide of the mark; it was too short and too high, while it was sorely overburdened with the elaborate "showman's" decorations. The wheels, while well made, were out of proportion and not correct to true traction engine practice; and this does not justify the description "freelance."

Flat wheels, even if they include the very wide flat spokes seen in this model, would probably collapse under the weight of a full-size engine, especially on a road which caused any sideways buffeting to be imposed on them. After all, there were very sound technical reasons for the somewhat elaborate form of construction adopted for most full-size road locomotive wheels, any departure from which, in spoked wheels, would be almost certain to lead to serious trouble.

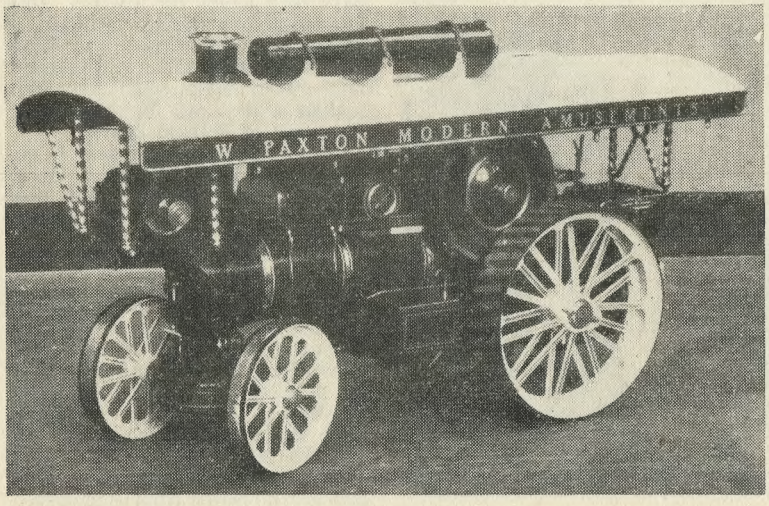
Freelance workers should not forget to consider technical matters of this kind, no matter what kind of model is being freelanced; if they do, the only possible conclusion that a technical man can come to is that they are endeavouring to dodge some important fundamental principles. In engineering, as in most other things in life, this is "not playing the game."

I am sorry to write in this strain, because Mr MacLellan had put a lot of work into what might otherwise have been a very fine job. It is one of those cases in which more careful attention to design and the application of sound engineering practice, even when freelancing, would have made a world of difference.

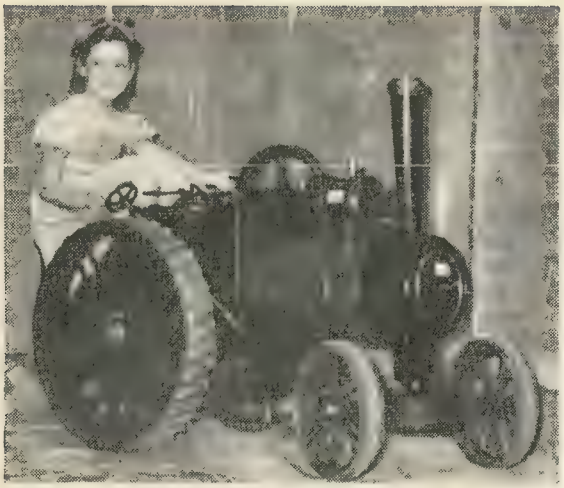
The four non-competitive engines that I noted were all first-class jobs, three of them old friends which I was glad to see again. The newcomer I may have seen previously, in bits and pieces; but at the show it was complete, though unpainted, and was connected to an airpipe line on the SMEE stand.

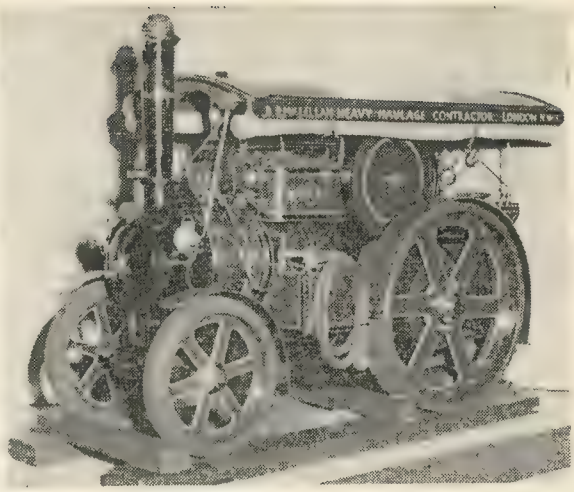
It is another 1½ in. scale Burrell Devonshire engine, true to scale and incorporating some very fine workmanship. On the stand, it was ticking over sweetly and quite slowly, without showing the slightest sign of hesitation at any part of a revolution. If this engine is entered for any future competition, I am certain it will win a high award.

Probably the oldest of the quartet was the fine 2 in. scale Fowler single



W. Paxton's 2 in. scale freelance compound showman's engine, which owes much to Fowler influences





cylinder agricultural engine built in 1920 by A. J., G. W. and F. Eaves, of Eynsford. Unless my memory is playing tricks, this is the engine which, when it first came to the ME Exhibition many years ago, was driven under its own steam all the way from mid-Kent to the Horticultural Hall, and back again after the show. In the meantime, it was steamed periodically in Vincent Square, hauling trains of excited children. It still looks the same as it did all those years ago and has obviously been well looked after.

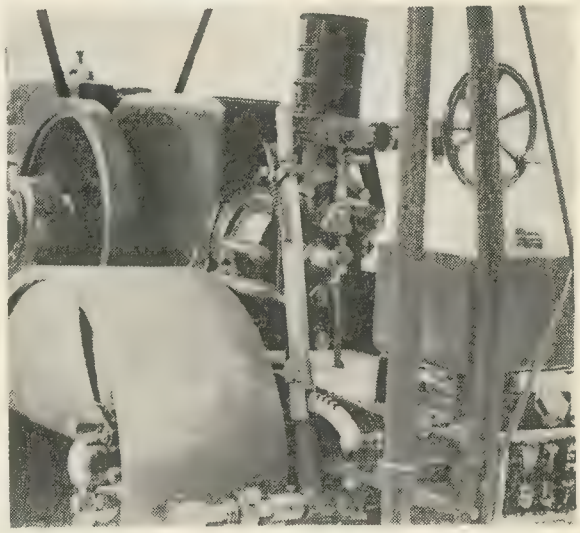
This year, another performer in Vincent Square was the 2 in. scale traction engine made by H. Winton, of Acton, and described in MODEL ENGINEER for August 1. There is nothing for me to add by way of description, but I just cannot refrain from remarking that this engine is a freelance job *par excellence*, to my way of thinking. It does not violate any fundamental principles, and it can scarcely be faulted in the application of sound engineering practice. In short, it is a very fine job in every way.

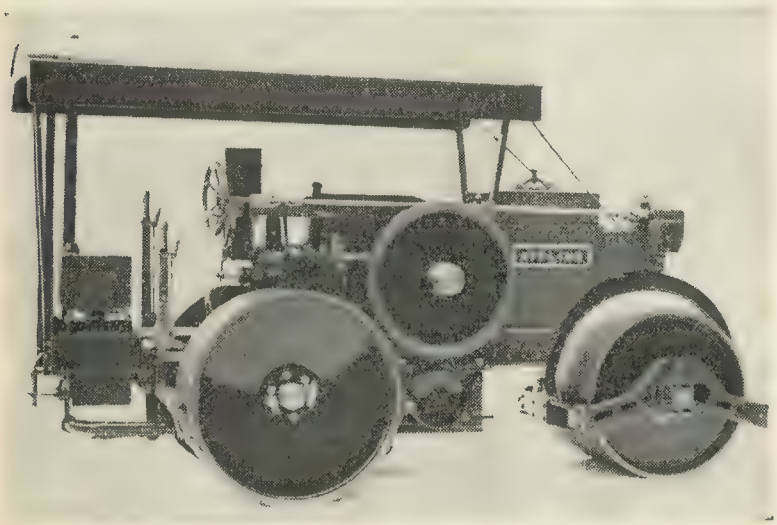
Above, left: The big model traction engine built by the Eaves brothers

Above, right: Freelance copy of a Marshall steam road locomotive exhibited by Donald S. MacLellan

Right: Close-up of the Aveling model road roller

Below: W.T.Eridge's road roller, which is driven by a miniature i.c. engine





The fourth engine I want to mention is the 2 in. scale showman's locomotive exhibited on the North London SME stand. It is the kind of model that cannot be seen too often. What I like about it is that it is very well proportioned and, in spite of the accurate reproduction of all the picturesque showman's style of adornment and decoration, it does not overstep the bounds of imagination in this feature.

So often, a model of this kind is spoiled by the builder putting on some fanciful additions of his own, which the old showmen, for all their love of gaudiness, would never have thought of. ▣

Ye Olde Model Shoppe

J. N. MASKELYNE reviews some of the historic models at this year's show

THIS collection of old-time models, tools and items of scientific apparatus, most of it dating from early Victorian times, created as much interest at the ME Exhibition this year as it did last year, in spite of the fact that the number of exhibits was smaller.

I happen to know, however, that Mr Appleby's entire collection is so extensive and varied that a selection might well be lent to the ME Exhibition for many years yet. This year, the majority of the models were locomotives, nearly all of them of the kind that exasperated young locomotive enthusiasts, including myself, more than fifty years ago.

Looking back to that time, the wonder is that such models could have been in production for so long; for their general design and construction had, even then, remained practically unaltered during some forty years or so and were not even remotely like any locomotives known to us! To be fair, they could be persuaded to go under steam, and some would even haul a few coaches of sorts!

Actual examples of these locomotives were on view and ranged from 1¼ in. gauge to 5 in.; one of the best was a 5 in. gauge representation of a 2-2-0 Bury engine which, as a representative model, was quite good in appearance. But, even fifty years ago, this engine was regarded as being very old-fashioned and not in the least like the engines we enthusiasts were wanting.

The same could be said of the smaller engines that boasted 2-2-0, 0-2-2, or 0-4-2 wheel arrangements. Cylinders, which were almost invariably of the oscillating pattern, were either at the front or at the back of the engines, though some of the better class of models originating on the Continent indulged in the luxury of "double-acting slide valve cylinders," possessing the great advantage, from the purist's point of view, that they did not oscillate.

To see these things again after so long is extremely interesting, to say the least, and the present generation probably finds them very amusing, especially those quaint little engines which, in my young days, were known as "seven-and-sixpenny dribblers." Two of these were exhibited; they ran, either on a boarded, or linoleum-covered, floor, or on a 2½ in. gauge tinplate circular track.

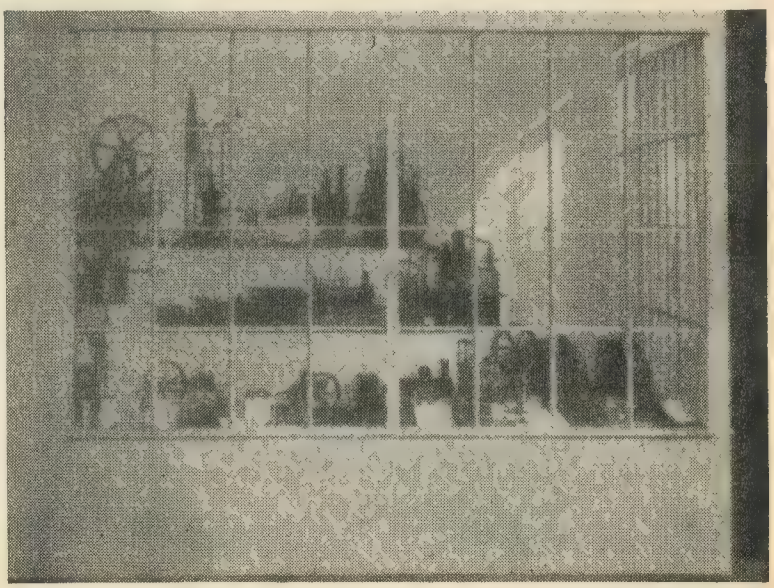
The boiler was a plain "pot" with a spirit burner underneath it, and was fitted with a small spring-loaded safety-valve that could be removed and replaced by a tin funnel when the boiler required filling with water. Two oscillating cylinders were fitted outside the frames at the *back* end of the engine, and the whole thing was about as much unlike a locomotive as it could be.

By way of contrast, there were two 1¾ in. gauge steam locomotives which dated from the 1905-10 period. Compared with the old "dribblers," they were really excellent, for they were very true-to-scale copies of their prototypes, and for this reason alone, they soon became popular. One was a London and North Western inside-cylinder 4-6-0, No 66, *Experiment*, introduced by the now-defunct, but famous firm of James Carson and Co., of Cricklewood, and the other a 0-4-0 Peckett saddle-tank brought out by Bassett-Lowke Ltd.

Both were quite good runners and a very great change from what had gone before; for they proved conclusively that near-scale steam locomotives, even so small as 10 mm. to the ft, could be made a practical success. The two examples on show appeared to be in very good condition, and they are about fifty years old!

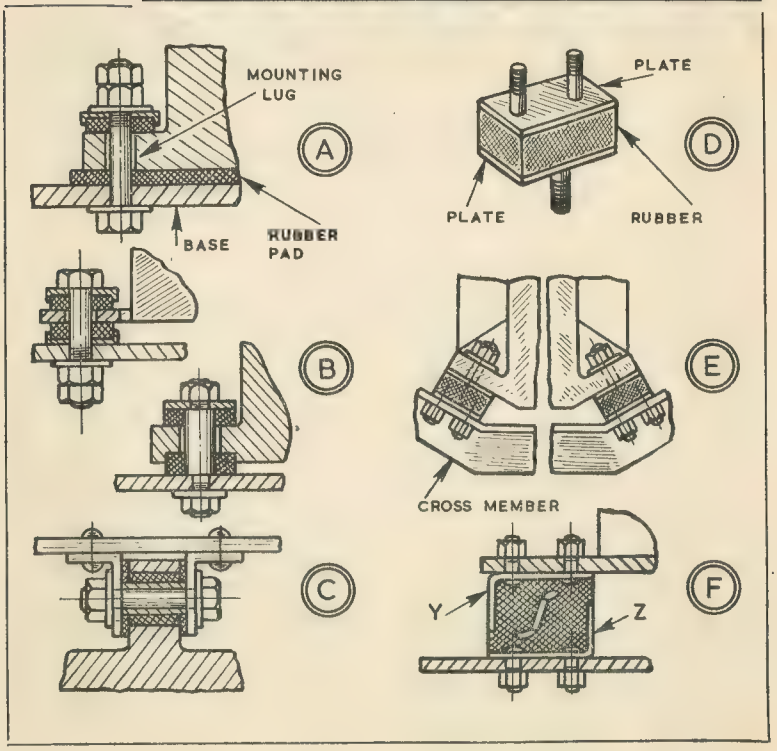
Other items in this memorable display included old table engines, vertical and horizontal engines and a copy of William Murdock's famous miniature steam-operated loco-motive vehicle of 1786.

I have no idea what sort of cash value could be placed upon a collection such as this; but, from the purely historical aspect, it is priceless. So, let us hope that an "Olde Model Shoppe" will be a permanent feature of future Model Engineer Exhibitions. ▣



Rubber mountings

By Geometer



RESILIENCE in torsion and extension and under direct pressure, coupled with ability to absorb shock and vibration, result in virtually infinite applications for rubber. As is well known, it can be stretched, twisted and bent, and under a compressive load will deform and accommodate itself reasonably to irregularities and contours, while bonding to metal, as accomplished in recent years, widens the scope from the facility with which machine and component mountings, in particular, can be made and installed.

The benefits resulting from such mountings are avoidance of strain on components in flexing installations, and suppression, or limitation to the source, of vibration and noise. With rigid mountings, it is obvious that strain is set up elsewhere when part of a structure deflects. It is clear, too, that vibration travels more freely between components more or less rigidly joined than where they are separated by a flexing medium—and the same is true of noise.

In the case of these—vibration and noise—suppression or limitation involves isolation of machines and components from direct or rigid contact with sounding or transmitting mediums—which may be tables, benches or stands; floors or walls of buildings; frames or chassis of vehicles. For portable machines—like typewriters, or installations like motor-driven compressors on stands, rubber feet may be enough—the cup type, obtainable in various sizes and designs to fix with bolts or screws backed by washers or metal plates.

For semi-permanent set-ups, like bench grinders or lathe motors, sufficiently rigid mountings can be obtained, together with a high degree of vibration and noise absorption, from use of soft rubber padding below and rubber washers on top of mounting lugs—as at *A*. Advisedly, the holes in the lugs should clear the bolts—which should have flanged washers on the rubber washers to prevent splaying, plain washers, and lock-nuts for adjustment.

Similar mountings are on occasion employed for the radiators of motor vehicles where leaks might ensue from strain or vibration. The rubber pads may be square or rectangular, or circular washers, and the bolts fitted with lock-nuts, as at *B* (left) or shouldered or fitted with distance pieces to pull firmly to the cross member. When the bolts are fitted with lock-nuts, care must be exercised in tightening to apply sufficient but not too much pressure, which could excessively splay the pads or washers.

In some machine and engine mountings, overtightening is obviated by employing shouldered studs, as at *B* (right). Total thickness of lugs and rubber washers then controls the degree of firmness of the mountings, and too much flexibility or slackness can be corrected through thicker rubber washers, or flat metal or fibre washers, fitting on the larger diameter of the studs. Shallow cast or machined recesses in the undersides of lugs of such mountings, as shown, are to locate and limit the splaying of the rubber washers.

Horizontally-disposed lugs to fit between angle brackets on a chassis or frame may be arranged as at *C*. Each lug for such a mounting has a circular bore containing a rubber bush and a longer steel distance piece, a close fit endwise between the angle brackets, so the bolt can be firmly tightened. Two large-diameter rubber or fibre washers, locating on the ends of the distance piece, centralise the lug.

A typical rubber-bonded mounting is as at *D*, a block of rubber between steel plates containing studs—or alternatively extended at the ends for bolt holes. Stability for engines may then be afforded by disposing pairs of mountings at an angle, as at *E*, which reduces side movement that could otherwise occur. Alternatively, as at *F*, when mountings are fitted flat, endplates may be turned down the sides, *Y*, *Z*, and on occasion the mounting may include a central plate. Correct fitting in the original attitude is then important when renewals are made. ▣

Duke of Edinburgh Trophy

JUNIOR SECTION · STUDENTS' CUP · TOOLS AND EQUIPMENT

Reported by Edgar T. Westbury

THERE were five entries in this class and, under the conditions of the competition, all have won major awards at previous Exhibitions, so it is unnecessary to comment on their quality, which is obviously outstanding in every case. For the benefit of readers who are not familiar with these models, however, a brief description of them may be of interest.

The model of a Savery triple-expansion steam launch engine by A. W. G. Tucker, which won this trophy, is a faithful reproduction of a very interesting prototype of 90 h.p. (rather a small engine to be so fully equipped, complete with condenser, air pump and centrifugal circulator) built to a scale of 3 in. to 1 ft. It is the work of an exhibitor who has produced several other remarkable models, and gained a record number of awards in the past.

The model of the historic locomotive *Puffing Billy* by J. S. Youngman was described by a critical observer as "rather scruffy"—which is just what it is intended to be, as a meticulously true copy of its prototype, which was one of the pioneers of locomotive development, and spent its working life in the hauling of coal trucks and other heavy freight. Every imperfection in the workmanship of the original, and scars of accidental wear and tear, were reproduced in the model, which bears close inspection with a photograph of the actual engine.

The four naval open boats by G. H. Draper were also an example of exact scale detail and superlative craftsmanship, made by a member of the team which produced the model of the *Magpie* presented to the Duke of Edinburgh five years ago.

Readers who have followed the recent description of the ME Musical Clock will need no introduction to its designer, C. B. Reeve, who contributed another of his masterpieces to this competition, namely, a chiming and striking long-case clock. This was shown working throughout the Exhibition, and its chimes were broadcast over the public address system.

Aircraft history was represented in a scale model of the Bleriot type XI monoplane of 1913 by P. G. Cooksley. This was a reproduction in minute detail of a machine developed from that in which its designer made the first crossing of the English Channel in 1909, with an Anzani engine of no more than 35 h.p. The type modelled had a Gnome rotary engine of 50 h.p., and was adopted in this country by the Royal Flying Corps prior to the first world war.

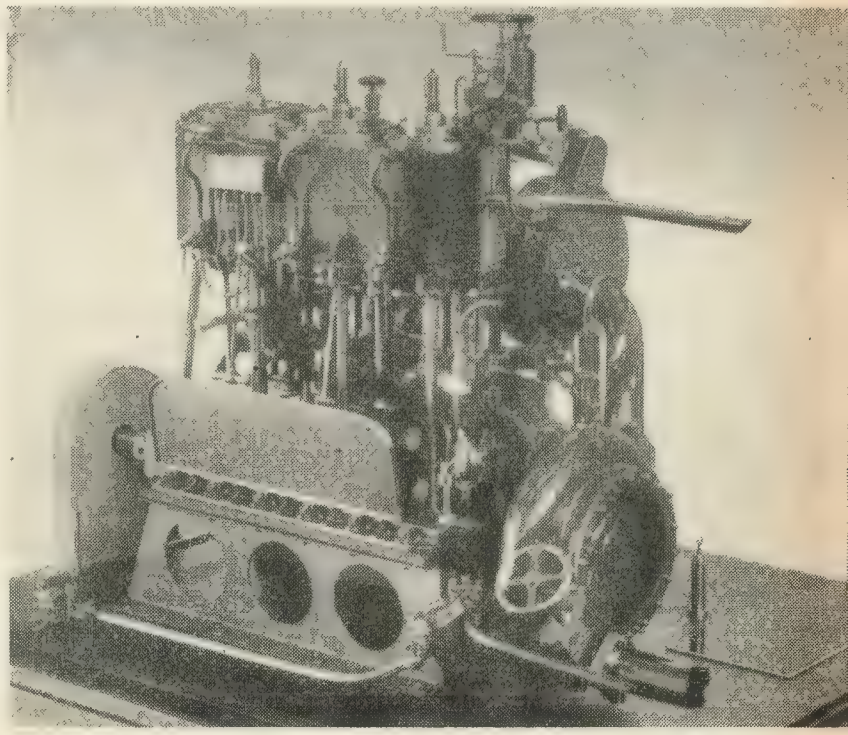
This is the only competition in the Exhibition in which the same model can compete a second time, and only one award is given. Apart from the special distinction which is conferred on the winner of the trophy, it gives an opportunity of showing visitors some of the outstanding models of previous years, and making comparisons with the present-day standards of work.

JUNIOR SECTION

THE models produced by competitors below the age of 16 continue to show steady improvement each year, thus conforming to the progressive standards of the Exhibition as a whole, and most of the twelve entries seen this year showed promising, though immature, craftsmanship.

Many juniors are still inclined to bite off more than they can chew, by attempting to build elaborate or minutely detailed models, and one cannot help feeling that they would do better to make a start on simpler models. But I have yet to meet the novice of *any* age who was willing to build the kind of model that more experienced advisers consider most suitable for him !

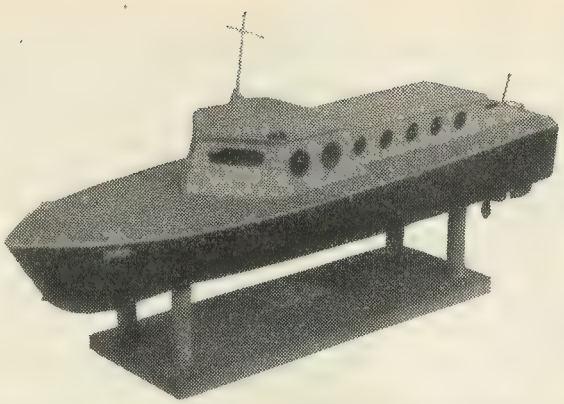
Marine models were, as usual, the most popular in this section, accounting for eight entries, of which five were power driven, the others being waterline models. The latter included the two naval vessels, namely the frigate *Amethyst* and destroyer *Dodger*, by Adrian Bomback, which contained a good deal of detail work in the superstructure and deck fittings, mostly well proportioned, and the finish was in matt grey, producing a neater



Below left: A. W. G. Tucker's triple-expansion engine which won the Duke of Edinburgh trophy

Right: An electric powered launch by Clive Hoskins

Below, right: This working anemometer by Robert Riley gained the award of the Students' Cup



effect than the glossy enamel, often heavily applied on some models.

Finish and painting were the weak points of an otherwise good model of the *Rowallan Castle* by Roger A. Carr, who also entered a twin-cylinder steam engine, to which the same criticism applies. Among the simpler types of powered craft, the electric launch by Clive Hoskins and the diesel-driven police launch by John Paxton showed neat and careful workmanship. The RAF tender by A. E. Hames struck a happy medium between the simple and elaborate.

A really outstanding model, which would not have disgraced a constructor of much greater experience, was the royal yacht *Britannia* by John Dennys. This not only showed up well as an exhibition model, but also performed successfully on the marine tank; it qualified also for the award of the Exide Cup for the best example of an electrically-equipped model.

Mechanical models generally present difficulties to junior constructors, at least if they have to rely on their own resources, as few of them have proper facilities for this work, but one very good example of this type was the Stuart Turner beam engine by Paul Harris. This contained some very competent work in the machining and fitting work, a point of particular merit being the neat shaping of rods and links, especially the eyes and fork joints, which are only too often slovenly and crudely finished.

It is sometimes complained that the judges are not sufficiently tolerant regarding the shortcomings of junior efforts, but it can be said without hesitation that every sign of latent talent is carefully observed and given the utmost encouragement. In a national competition, it is, of course, essential to maintain a very critical standard, and the aim, in common with that of all model engineering, is to promote skill in the construction of models from raw materials, as distinct from assembly of partially or completely preformed kits of parts.

STUDENTS' CUP

ENTRIES in this competition were more numerous than ever, totalling 27 individual and team exhibits, and embraced a wide variety of subjects. An imposing array of model steam engines, mostly of one type, was entered by the Tylers Croft School Model Engineering Club; all of these were up to a competent standard of accuracy and finish, but the general effect was that of the output bay of a mass production factory.

It is, of course, quite understandable that a single type of model offers the best facilities for school workshop training, but is somewhat monotonous in an exhibition display. In one or two cases, however, a complete steam plant was submitted, and there were also two well-made drilling machines in the above school collection.

The most interesting item of tool equipment in this class, however, was a small lathe made by Robert Potts, of the Tylers Croft team. This was of individual design, and construction, including patterns and castings, the material for which was obtained by melting down aluminium milk bottle tops. A feature of the design which deserves commendation was the use of two square steel bars, set corners-up, for the bed slides.

While there were several points open to criticism both in the design and workmanship of this lathe, it is undoubtedly a practical machine, on which one may well expect that the constructor will be able to carry out much useful and more advanced work in the future. Such efforts are deserving of the utmost encouragement, however immature they may appear, and this matter was not overlooked by the judges.

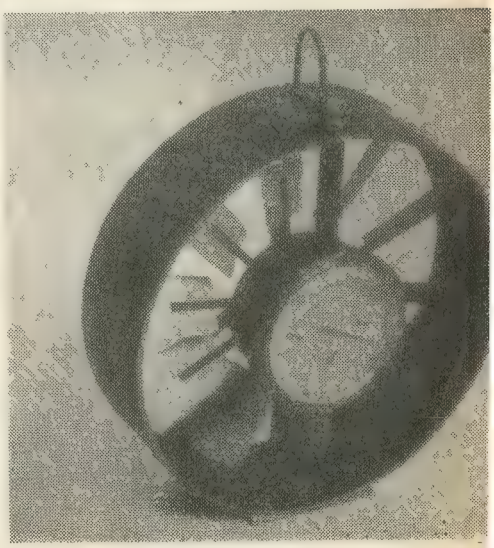
The Rayleigh County Secondary School produced a more varied selection, including two horizontal steam engines, one of which was equipped with a governor, a vertical engine with reverse gear, and a simple oscillating engine. Unfortunately the finish of these engines included a lavish use of chromium plating, which is a certain destroyer of realism in model engines, and is furthermore capable of either marring good workmanship or concealing defects.

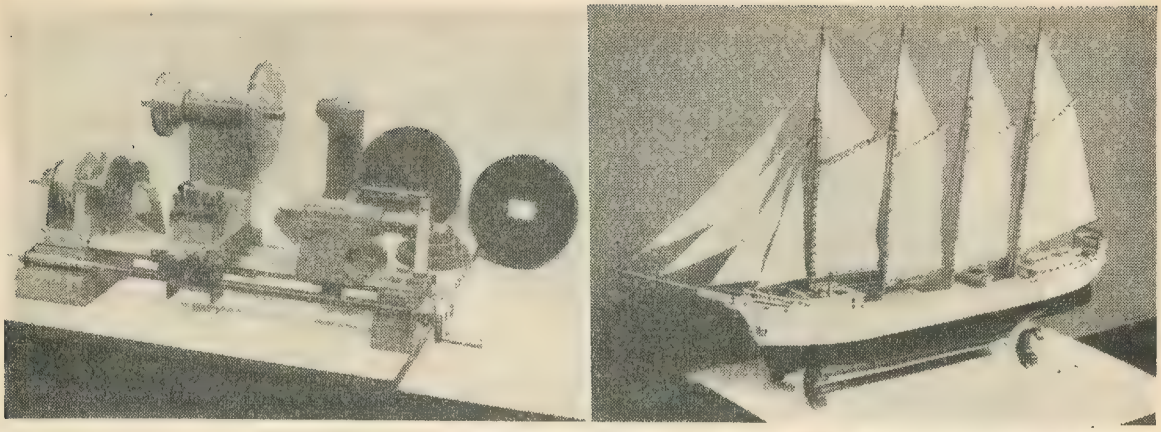
Among individual exhibits in this class were two interesting marine models, one being a model of the four-master schooner *Helen Barnet Gring*, and the other a twin-screw luxury liner of the future. Both of these were of a standard comparable with that of some marine models in senior classes, and in the latter case, the design was imaginative without being too blatantly futuristic.

Only one locomotive exhibit was shown in this class, namely a 2½ in. gauge eight-wheeled tender, by Richard Nixon; the workmanship on this was of a good standard, as far as it went, but it was badly let down by the poor quality of the painting.

Instrument making, in two individual entries from students of the Northampton Secondary School (which, despite its misleading title, is at Clerkenwell, London, EC1), won the highest honours in this competition. The first of these, a planimeter of the Amsler type, for the measurement of areas on maps, charts, indicator diagrams or other irregular shapes, was made by David Holt, and the relatively simple, but necessarily precise, mechanical parts appeared to work smoothly and correctly.

In the second example, an anemometer by Robert Riley, the mechanism was much more complicated and no less precise; it is most essential that an instrument of this type should work with the utmost smoothness and efficiency, as the slightest friction impairs its accuracy in measuring light air currents.





Left: A small lathe by Robert Potts, showing patterns for the structural castings. Right: Model of the American schooner HELEN BARNET GRING. *Modeller was John Dennys*

Proof of the quality of the instrument was seen in its ability to react to the slightest movement or draught. Detail finish, including dial marking, was extremely high; as a result of which it was an obvious Cup winner.

TOOLS AND EQUIPMENT

VARIOUS ways and means for improving the facilities of a small workshop were reflected in the exhibits shown in this class, and they invariably displayed a good deal of ingenuity and original thought. Both amateurs and professionals found much to interest them here, and every year sees new developments in tools and appliances ranging from the simple to the elaborate.

Lathe attachments, as usual, were well represented this year, and one of the most interesting exhibits was the group of ornamental turning appliances by J. A. Pickles, a well-known exponent of this particular art. The set comprised a geometric chuck, spherical slide-rest and universal cutter frame, which were designed and constructed in the style of Holtzapffel and his contemporaries, employing bronze castings in many cases instead of cast iron as in general modern practice.

A great deal of hand work as well as intricate machining is involved in such appliances, and both the workmanship and finish of these items was beyond criticism.

The two attachments for a 3½ in. lathe by Mervyn Vest, a fine feed gearbox and a boring head respectively, were practical and well made, though the quantity of work involved was not great in comparison to that in some other exhibits. A dividing attachment for a Little John lathe, by R. W. Mason, was also a good example of practical utility, the workmanship, including that in drilling the two division plates, being of a high order; and the same applied to this exhibitor's engraving machine, based on the Duplex design, shown in the loan section.

A third exhibit by R. W. Mason, a double-ended tool grinder with an auxiliary high-speed spindle, intended specially for grinding carbide-tipped tools, was built largely from scrap, with the accent on utility.

Some of the exhibits in this class were of a type not usually associated with amateur workshops, and were quite obviously produced with the resources of a modern industrial tool room. Most of these reached a high standard of precision and finish, but involved an entirely different order of craftsmanship from those produced with the limited, and often primitive, equipment of the home workshop. This applied to such items as the comparator stand by R. W. Davis, the rotary vice by K. D. Waite, the vernier height gauge by P. Wookey and the universal vice by D. P. A. Gibson.

A ball drilling machine by M. P. Try incorporated several ingenious features; it embodied a motor-driven drill spindle with lever feed, and a fixture with universal swivelling adjustment to hold the ball at any angle, while retaining it in central alignment with the drill. Both in design and workmanship, however, it was open to criticism in respect of details, including the use of laminated plastic structural parts.

The flat scale marking machine by R. J. Perry had a table sliding on two round bars, with a standard micrometer head fixture at the end of the base, to be used apparently in conjunction with slip gauges, to deal with scales of any length up to maximum traverse. A fixed post in the centre held a pivoted bar to carry the cutting tool, adjustable stops being fitted to limit cross travel in either direction. Workmanship and finish were typical "tool room," but it is felt that design might have been considerably improved, especially in the means of cross traversing and setting the depth of the cut.

Complete machines in this class included the jig-saw machine by W. T. Eridge, which followed the Duplex design, and appeared to be a practical appliance, though having no outstanding features. The 4 in. hack-saw machine by W. Richmond is apparently of individual design, and contained several refinements, including a chain-driven coolant pump, and means of adjusting the angle and position of the work vice. This machine appeared to be unduly massive for the duty it performs, and one or two features of design seemed more elaborate than necessary, but its utility was beyond question.

Two watchmaker's lathes were entered in this class, the first, by J. H. F. Wadsworth, having the usual bar bed, and a simple saddle carrying a hand rest, but in other respects it departed from orthodox design by the use of large diameter ball-races for the mandrel bearings. A point open to criticism was the rather excessive overhang of the mandrel from its bearings, especially at the nose end; this would be more appropriate to a polishing head, but is undesirable in a turning lathe. The machine also lacked the precision and finish normally associated with lathes in this class.

As a contrast, the other lathe was of orthodox design and characteristic finish, also much more completely equipped, with a swivelling compound

slide-rest, and double opposed cone bearings in the headstock. The slides were hand scraped, and indices were fitted to the feed screws, all working parts being nicely fitted and, so far as could be judged, up to the professional standard of precision.

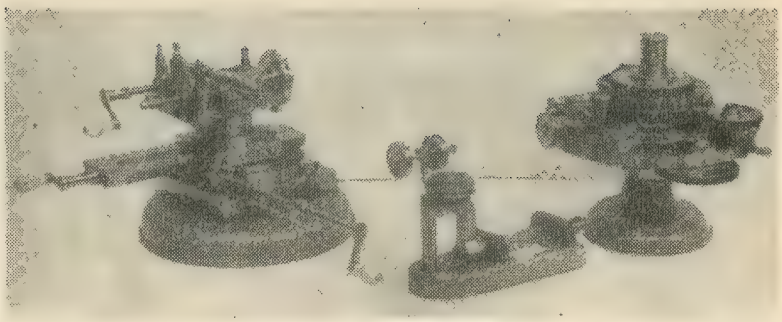
In the loan section, an exhibit described as "a general purpose model maker's machine tool" was exhibited by W. D. Urwick, and this was demonstrated in action on the ME workshop stand. It is based on a similar machine by the same constructor which appeared at a previous exhibition, but has been improved in detail and a drilling attachment added.

The machine consists of a fully equipped screwcutting lathe, having a cantilever bed, mounted on a circular slide with means of vertical adjustment. A separate slide, attached to the headstock, carries the back centre, which is thus maintained in true alignment with the headstock centre irrespective of the height of the bed. By the use of the elevating bed, the machine provides facilities for boring or horizontal milling, and the accessories include a boring and facing head which further extends its scope.

The headstock is reminiscent of the pre-war Super-Exe lathe, in the use of outboard driving pulleys, one of them of very large diameter to provide low speed in lieu of back gear, also drilled with 60 holes for indexing.

TRADE SECTION

MACHINE tools and accessories showed no spectacular new developments, though there were some minor improvements and additions to available equipment. On the Myford stand, new attachments for the ML8 lathe for mortising and tenoning operations were demonstrated; in conjunction with the bandsaw, circular saw and planer attachments already available, they make this versatile lathe into a complete woodworking machine.



A group of ornamental turning appliances by J. A. Pickles

The range of accessories for Box-ford lathes has been extended, and now includes a long T-slotted cross slide, which can be used as a boring table, or to carry further tool fixtures such as a rear tool post. The Box-ford power shapers were demonstrated in action, also the tool post grinders, which have been improved in detail.

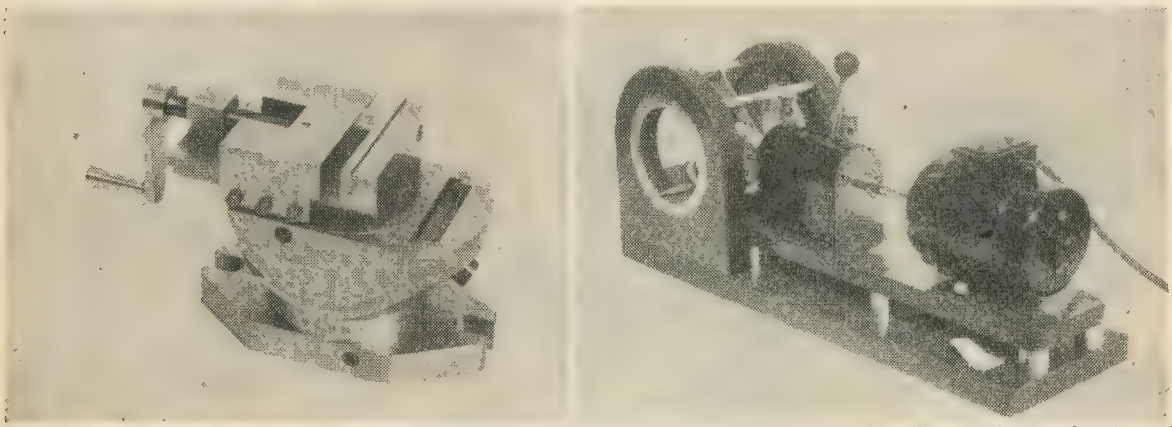
Two interesting new bench tools were shown for the first time this year, namely the Rotacut hand lever shearing machine and the Hobbyfix universal clamping tool. The former has an all-steel frame and is equipped with two hardened circular blades, the upper of which has a serrated edge for feeding the material. The hand lever turns this blade by means of a pawl and ratchet wheel, the action being reversible so that material can be backed out when cutting to a limited depth. The lower blade is eccentrically mounted for adjustment.

This tool is made in a range of six sizes, the smallest of which will cut mild steel up to 16 gauge, while the largest will deal with mild steel up to 8 gauge, or stainless steel up to 10 gauge. A recent addition to the range is a lever punching machine having a similar basic structure to the shearing machines.

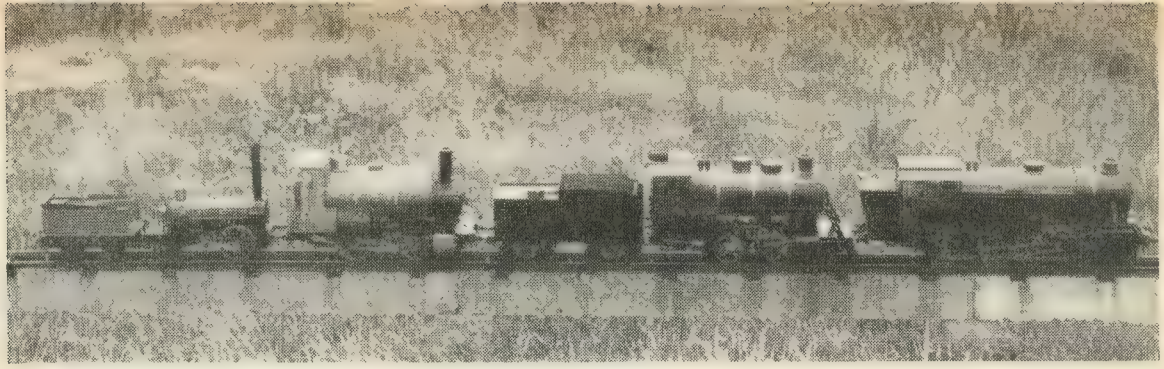
The Hobbyfix device embodies a very ingenious clamping fixture which can be used either as a bench attachment or a portable tool. It can be used as a vice for wood or metal, a clamp to hold work down on the bench, or with the addition of extension jaws or other fittings, as a joiner's cramp. A further adaptation consists of using the centre feed screw as a spindle to drive a drill or screwdriver blade.

Other interesting items of equipment included the sample display by Messrs E. W. Cowell, of Watford, featuring their well-known hand shapers and lathe fixtures. In addition to their usual stand featuring castings and other model supplies, Kennion Bros had an extra stand devoted entirely to tools.

It is regretted that some of our friends in the trade who specialise in engineering tools were not with us this year, but it is to be hoped that they will be with us again next year.



Left: A universal swivelling and tilting machine vice by D. P. A. Gibson. Right: A ball drilling machine with universal angle adjustments to work fixture by M. P. Try



The result of 14 years' hard labour !

ALL BUILT FOR HARD WORK

A. H. CASTLE seems to have specialised in building 5 in. gaugers, hauling up to two tons, for arduous duties on the club track

It all began in September 1943 when I was presented with a block of cast iron 6 in. × 3 in. × 2 in. The donor suggested it would make a good base for a scribing block, but I had other ideas.

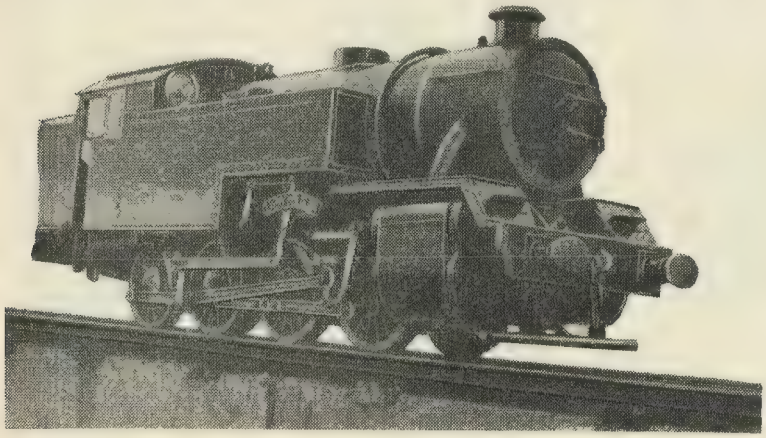
For years I had wanted a 5 in. gauge steam locomotive and I could see that that piece of cast iron would make a pair of cylinders. At that time I never even had a vice so the block was nailed to the bench and cut in halves. Using LBSC's *Austere Ada* notes as a guide, with dimensions increased 50 per cent, the blocks were marked out and sent to the local works who rough-drilled the bores 1⅛ in.

An advert in ME resulted in four 5 in. dia. driving wheel castings, so a lathe was now needed.

A pre-war 3 in. Gamage lathe was acquired, and with only a handle on the end of the mandrel as motive power, wheels and axles were turned, axleboxes and cylinders were bored and I could wheel the chassis up and down the bench. Port cutting needed something faster than this, so a treadle was improvised from a discarded car flywheel. With this set-up, plus a ⅜ in. bench drill driven from the same flywheel, my 5 in. gauge saddle tank locomotive, *Lady Rosalie*, was completed in four years.

Chassis details: frames 25 in. × 3 in. × ⅛ in.; wheels 5 in. dia.; wheelbase 9 in.; cylinders 1¼ in. × 1⅞ in.; steam ports 9/64 in. × ¾ in.; exhaust ⅜ in. × ¾ in.; axle feed pump ⅜ in. × ½ in. It has Walschaerts gear, twin mechanical lubricator (it was found that a single did not evenly distribute the oil) and cylinder cocks (so essential with cast-iron cylinders) operated from the cab.

The first boiler made for this chassis was fitted with 9/16 in. flue tubes made from plumbers' copper pipe, this being the only material available due to war-time restrictions. It made enough steam to haul ½ ton but it was impossible to keep any paint on the smokebox.



This boiler has since been replaced by another 17 in. long × 4¼ in. dia. fitted with ⅜ in. flue tubes and two 1 in. superheaters, which keep the smokebox much cooler. The saddle tank holds one gallon, and there is a hand pump in the cab.

This locomotive was completed in September 1947 and has been running ever since on arduous club work. During this time the cylinders have been relapped twice and oversize pistons fitted, stainless steel being found the best for this.

The bug had now really bitten me and casting around for another design the choice fell on LBSC's *Rainhill* as being something different. It was scaled up to 5 in. gauge, multiplying by ten and dividing by seven, but using the decimal system which seems to me simpler than the fractional.

For example, 2⅛ in. is put down as 2.125 in. Multiplying by 10 is done by merely shifting the decimal point so all that remains is to divide 21.250 by seven and you have your new dimension to a thou.

The chassis was completed by this method, the only addition to the original specification being the fitting between frames of a twin mechanical lubricator. Incidentally, whenever I am making standard items such as lubricators, donkey pumps, hand pumps, safety valves, cylinder cocks, etc., I always make double or triple the quantity required and this policy has saved much time over the years.

However, to revert to *Rainhill*, the

boiler was made smaller in scale diameter so that I could have a straight sided inner and outer firebox. It is 3¾ in. dia. × 12 in. long overall. Firebox grate area is 4 in. × 3 in. There are two superheater tubes ⅝ in. dia. and 11 flue tubes ⅜ in. dia. The boiler is lagged to bring it to 4 in. dia.

This locomotive was built in 18 months' spare time. It was originally fitted with driving wheels as supplied for *Hielan' Lassie*, but on a visit to the West Riding's track at Blackgates one of these wheels disintegrated with disastrous results to the locomotive. It was rebuilt with a pair of wheels cut from mild steel discs which gave me the opportunity to make them look more like the prototype.

Some of this work was carried out on the sands of Westwood Ho! while on holiday. I have had much fun with this locomotive, my wife and I dressing in period costume, and I pass my thanks to LBSC for suggesting this idea at the conclusion of his article on *Rainhill*. I have named my edition *Georgie* in honour of the great man who created the prototype.

The queues at the local track were getting bigger and bigger and it was realised that a locomotive was needed that would shift loads of up to two tons. The old lathe was disposed of and an ML7 purchased and a design was prepared for an 0-8-0 tank with two cylinders 1¾ in. × 2½ in. and Baker gear for a change.

It was decided to experiment with a steel boiler and one was made of the wide firebox combustion chamber type. Length was 21 in., dia. 5½ in., grate area 5 in. square. There were to be four cross water tubes of steel in the combustion chamber; three 1 in. superheater flues and 13 ½ in. flues were of copper.

Firebox was of ⅛ in. steel plate, the wrapper plate being bent by bolting it to a Morrison indoor table shelter. A baulk of timber was clamped to the projecting part of plate, a steady heave, and the plate bent as simply as that.

Firebox door plate and throat plates were flanged in the ordinary way over steel formers and only needed annealing twice. The combustion chamber was made from 4 in. dia. steel tube, flattened in one place to form the top. This was made first and the rest of the firebox built around it as LBSC's instructions for the ten-coupled *Austere Ada*. Girder crown stays were of ⅛ in. steel plate, and the combustion chamber tube plate was $\frac{3}{16}$ in. steel plate, not flanged, just a jam fit in chamber.

Before assembly the tube plate was set up on the face plate and all flue holes internally screwcut 56 t.p.i. to fit the flues which had been previously screwed. Firebox assembly was then Sif-bronzed by a fellow club member, and the tubes screwed in. The few weeps took themselves up on the first steam test.

Smokebox tube plate was made from ¼ in. mild steel plate counterbored ⅛ in. deep × 5 in. dia., leaving it like a flanged plate. Plate and tubes were silver soldered in front of the boiler. This job needed two five-pint lamps and a two-pint. Back head was cut from ⅜ in. m.s. plate, counterbored $\frac{3}{16}$ in. deep to leave a flange and fixed to the boiler with 2 BA studs. Foundation ring was ⅜ in. square steel.

Firehole ring, of 2 in. steel tube ¼ in. thick, was reduced to ⅛ in. through the firebox and backhead. Firebox and longitudinal stays were ¼ in. steel rod.

As this boiler progressed I began to wonder if it would ever boil water, let alone do any work, but on first steam test, after being filled with boiling water, it was blowing at 90 p.s.i. in ten min. From all cold the time averaged 16 to 17 min.

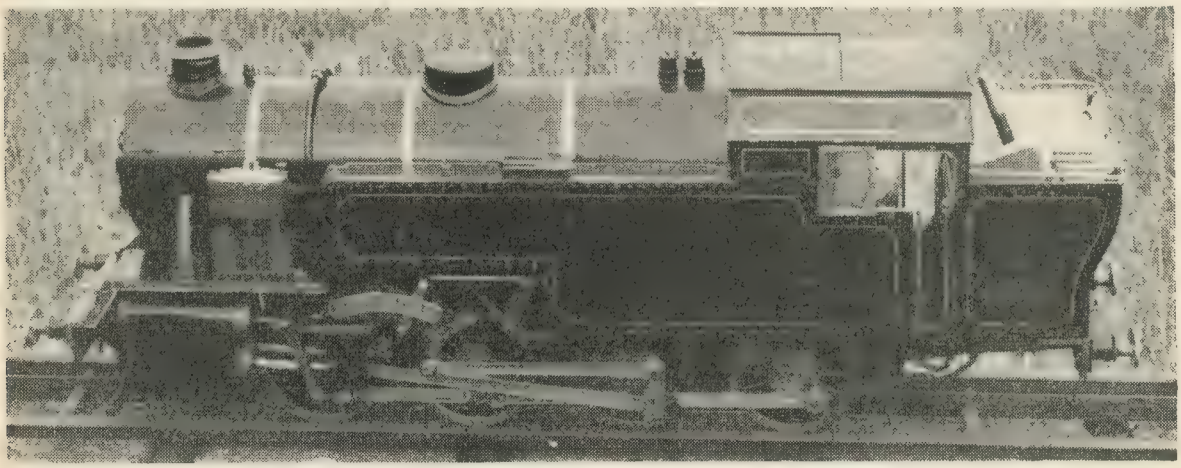
Fitted with this boiler, the locomotive, with a 30 cwt load, would shunt up and down a 100 yard track for four hours with the pressure never falling below 80 p.s.i. on Welsh steam coal. This boiler was in use for five seasons when it was removed for inspection and it was found that the firebox crown had corroded to wafer thickness. The boiler was cut up and it was found that this was the only place that had really suffered and had I used a thicker plate would have been in use now.

During the past winter a copper boiler has been made and fitted and the locomotive is running again better than ever. Other details of the locomotive: length over buffers 42 in.; width 10 in.; height 14 in.; weight 1¾ cwt; wheels 5 in. dia.; wheelbase 18 in.

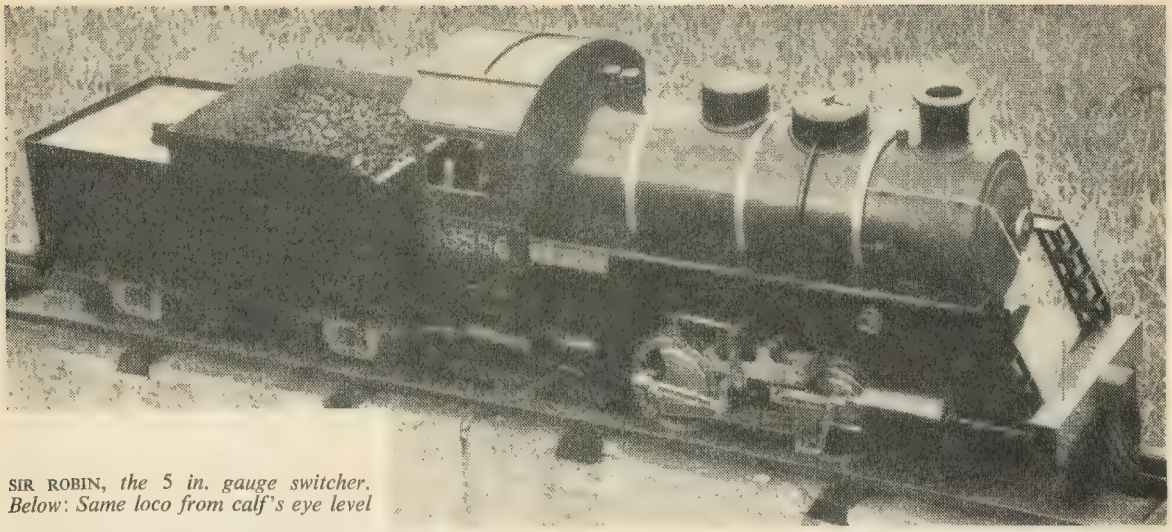
It has cast-iron cylinders and slide valves, the steam ports are $\frac{3}{16}$ in. × 1⅛ in.; exhaust ½ in. × 1⅛ in.; axle pump ½ in. × ½ in.; smokebox 6 in. dia.; side tanks and bunker capacity 1½ gal.

There is a hand pump in the bunker, and a twin mechanical lubricator.

It is painted dark blue, with red and white lining; buffer beams are red, smokebox black. The number on the bunker is derived from the date I first rode behind the locomotive —9-3-52. She is named *Lady Susan*.



This view of LADY SUSAN *clearly shows the valve gear and pumps. The view at the foot of facing page shows what an impressive lady she really is*



SIR ROBIN, *the 5 in. gauge switcher. Below: Same loco from calf's eye level*

During the winter of 1950-51 I made up two donkey pumps to Austen Walton's design. One was fitted to *Lady Rosalie* and the other to *Lady Susan*, and they have been working ever since with no trouble.

The end of 1952 I was looking for something else to make. I fancied an American outline, but light enough to be lifted unaided. I also wanted three cylinders to try out the six beats to a turn, but more than anything else I wanted an unobstructed firebox for easy cleaning and maintenance, so a design was prepared for an 0-4-0 switcher with tender.

The inside cylinder proved a headache. I wanted it on the same plane as the outside cylinders so I could use the Gresley two to one conjugation for the inside valve. This meant that the leading axle was directly in the path of the connecting-rod, so I fell back on the idea used by James Holden on the old GE Decapod (many thanks, LBSC, for your photograph and sketch of same).

The front axle is cranked the relative amount and the connecting-rod built in sections around it. To watch this lot revolving has fascinated all who have seen it and I am constantly asked if one has caught up with the other yet ! The two outside cylinders are as per Austen Walton's *Twin Sisters*, but only bored to 1¼ in. The inside cylinder is a block of bronze with packing pieces to fit between the frames. The main frames finish behind the rear wheels, then a wide cradle is fitted leaving the firebox clear. Wheels are 4¼ in. dia.

Axleboxes are fitted with large ball-races, ¾ in. bore 1⅞ in. outside, and the difference in free running is very noticeable. Baker gear, following its success on *Lady Susan*, is fitted to the outside cylinders.

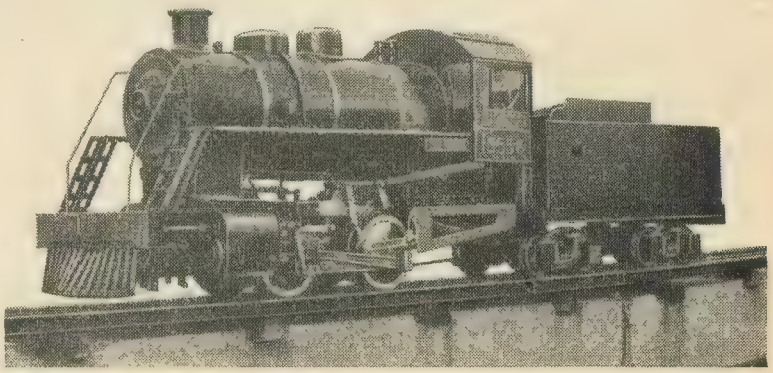
Wheelbase is 7 in.; twin axle pumps are ⅜ in. × ½ in.—only one is fitted with a bypass, the other pumps all the time. With the twin mechanical lubricator, one pump delivers oil into the steam line before it breaks in three, the other pumps directly into the cylinder bores. The boiler is made of two rings, the front half 6 in. dia. and rear half 6¼ in. dia. Overall length is 16 in., firebox is 5 in. square; the small combustion chamber is 1½ in. long with no cross water tubes. There are three 1 in. superheater flues and 18 ½ in. flues, but the superheater element is not fitted yet as I am running the locomotive in on wet steam. The clearances can be cut finer this way.

Tender is a double bogie pattern with steel sides and brass tank inside as I wanted the tender to be strong enough to ride on if necessary. For this reason the rear bogie is fitted with ball-races. I know switching locomotives do not have cowcatchers but this was put on to please the children at the local track.

In an effort to keep down the weight I used aluminium where possible, but it is still a hefty handful, approximately 100 lb. without tender. It is not quite finished, such items as sandbox, bell, cylinder cocks, etc., still needing to be fitted, but I was so anxious to get her on the track to provide something different.

On the club's first track day this year the switcher ran from 11 a.m. to 7 p.m., only stopping for fuel and passengers. On opening the smokebox at the finish there was only ¾ in. of ash in the bottom. I put this down to the continuous even blast of the six beats. Riding behind at a fair speed she sounds like a racing two-stroke.

Well, the above is the result of 14 years' locomotive building. There have been other jobs in between, such as six passenger cars, a drilling machine, accessories for the ML7 and my full share in the construction of the society's two tracks, and I get a bit sceptical when I hear that everlasting moan, " I can't find time." After all one can always arise a couple of hours earlier every morning ! ■



MPB REGATTAS

The International at Verulamium

Reported by Meridian

ONE of the largest international model power boat meetings ever staged in Great Britain took place recently at Verulamium.

Visiting competitors from the Continent numbered eight: J. Menant, M. Ostroslea, P. Mercier and J. Baillet, of Bordeaux; Gems Suzor, R. Grenier and F. Halpen, of Paris, and G. van Hoey, of Brussels.

This was the first time on record that more than three Continental competitors had taken part in an MPBA International and also the first occasion at which the association has had the pleasure of welcoming a Belgian model power boat enthusiast.

Owing to the close proximity of St Albans Cathedral the time allowance for the Sunday events was limited to a period between 12.30 and 6 p.m. But as there was a record number of both straight runners and hydroplanes this period was not sufficient.

Runs in the steering competition were, therefore, cut down to two, but even this measure did not enable the programme to be properly completed, for at the close there were still many competitors in the hydroplane event who had not been able to have a second run. The organisers finally agreed that the race would be decided on the first runs alone.

Steering re-runs

The Steering Competition had to be resolved by a succession of re-runs, for although E. Varey (Victoria) was undisputed winner with two bulls there were three others tying for second place. In the Nomination event S. Pinder—a junior member—registered his first big win with an all-correct nomination.

French competitors with their boats

G. Van Hoey, of Brussels, starting his boat

With so many new Continental craft competing in the hydroplane racing there was much speculation as to the likely results. Several of the French boats were very fast indeed, but R. Grenier, whose boat *Trident* made such a wonderful showing last year, was unable to get fully "wound up" and could not do better than 64.26 m.p.h. Under the rather breezy conditions that prevailed, this was a creditable speed and was good enough for fourth place.

For a long time M. Ostroslea's Class C entry held first place with 67.66 m.p.h., and excitement was intense when Ken Hyder's run with *Slipper 5* resulted in a fast time equal to 72.48 m.p.h. No one could better this, but Dick Phillips put up a good performance in achieving third place at 66.17 m.p.h.

An earlier start

On the Monday it was possible to make an earlier start and the officials were determined to get in the maximum running to try and make up for the disappointments of the previous day. Result: each competitor managed three complete runs.

Weather conditions were similar—sunny, but too windy for very high speeds. One competitor in particular

to experience this was G. Stone, for *Lady Babs* 2 tried to emulate an aeroplane on all three runs ! Such performances obviously lose much speed—even though *Lady Babs* herself has the knack of regaining the water right side up and continuing course.

The final results were of similar pattern to those the previous day except that P. Mercier (Bordeaux) was only just pipped for first place by Ken Hyder and M. Ostroslea dropped back into third position with *Dolphin* 6.

First six placings were all 10 c.c. boats though, as will be noted from the table, the leading Class A and B exponents were not too far behind. Several of the French boats were of similar design to *Trident*, and one firm impression is that they drive very easily, their fine planing angles being exploited with success.

Gems Suzor's *Nickie X* appeared rather unstable under these conditions and her best run was 55.73 m.p.h. Incidentally, the visitors had fitted silencers to their engines, and it was interesting to note that when one went adrift the noise more than doubled but the boat proceeded on its way at no greater speed !

G. Van Hoey (Brussels) had flywheel trouble on the Sunday but with the help of Dick Phillips he was able to enter the Ford race. The best run of this competitor's boat—*Scorpion*—was 51.7 m.p.h.

To conclude this report, it is obvious that maximum speeds—that is, under British conditions—have not advanced much since the Ford Trophy race was instituted at Derby in 1950. But it is also obvious that the general speeds have improved, for there are now many hydroplanes capable of speeds around the 60 mark. Some can approach and occasionally exceed 70.

If one compares this with 1950 when the majority of British exponents were far behind the leaders, it does show that some progress along the thorny path of speed boat development has been attained.

A group of competitors in the steering competition

J. Menant (Bordeaux) starts his boat, aided by a compatriot

G. Suzor (Paris), assisted by J. Menant, starting NICKIE X

The International at Verulamium . . .

continued

★

Right: The Mayoress of St Albans presenting Ken Hyder with the cup while the Mayor applauds

★

Below: F. W. Waterton (St Albans) starting TALLY HO

RESULTS OF ST ALBANS REGATTA

Nomination Event, 80 Yards

1	S. Pinder (S London)	—	nil	error
2	C. Drayson (N London)	*Nippy*	0.3	,,
3	W. Morss (Victoria)	*Edie*	0.4	,,

Steering Competition (two runs only)

1	E. Varey (Victoria)	*Mickey*	10	points
2	C. Washington (Victoria)	—	6 + 0 + 3	,,
3	R. Waterton (St Albans)	*Acklam Cross*	6 + 0 + 1	,,

Hydroplane Race (all classes) for K. Hyder International Cup

1	K. Hyder (St Albans)	*Slipper 5*	72.48	m.p.h.
2	M. Ostroslea (Bordeaux)	*Dolphin*	67.66	,,
3	R. Phillips (St Albans)	*Foz 2*	66.17	,,
4	R. Grenier (Paris)	*Trident*	64.26	,,

Class Prizes

A.	J. Benson (Blackheath)	*Orthon 2*	57.69	m.p.h.
B.	M. Daly (Blackheath)	*Nipper 3*	59.2	,,
C.	J. Jones (Altrincham)	*Mambo*	51.43	,,
CR.	P. Mercier (Bordeaux)	*Delta 4*	63.83	,,

MPBA FORD TROPHY AND NATIONAL SPEED CHAMPIONSHIPS

K. Hyder (St Albans)	*Slipper 5*	CR	68.7	m.p.h.	+ Wembley Cup
P. Mercier (Bordeaux)	*Delta 4*	CR	68.2	,,	
M. Ostroslea (Bordeaux)	*Dolphin 6*	C	67.66	,,	
G. Stone (Kingsmere)	*Lady Babs 2*	CR	66.17	,,	
R. Phillips (St Albans)	*Foz 2*	C	65.7	,,	+ C prize and Wico Pacy Cup
T. Everitt (Victoria)	*Bill*	CR	65.22	,,	+ CR prize
M. Daly (Blackheath)	*Nipper 3*	B	63.76	,,	+ B prize and Min. Speed Cup
C. Stanworth (Bournville)	*Spur*	CR	63.4	,,	
W. Everitt (Victoria)	*Melody*	A	62.08	,,	+ A prize and International Trophy
J. Skingley (Victoria)	*V7*	B	61.2	,,	
R. Grenier (Paris	*Trideht*	CR	60.82	,,	
J. Benson (Blackheath)	*Orthon 2*	A	57.69	,,	
J. Menant (Bordeaux)	*Spido*	CR	56.6	,,	
G. Suzor (Paris)	*Nickie X*	CR	55.73	,,	
W. Churcher (Coventry)	*Annette 3*	B	55.6	,,	
F. Jutton (Aldershot)	*Nike*	B	54.05	,,	
F. Halpen (Paris)	*Rock n' Roll*	CR	53.0	,,	
S. Poyser (Victoria)	*Steamick*	CR	51.88	,,	
G. Van Hoey (Brussels)	*Scorpion*	CR	51.7	,,	

Table shows placings of top 19—total entry 39

ROSE

This week LBSC begins the description of a simple boiler for this locomotive

Continued from 12 September 1957, pages 377 to 379

THE spirit-fired water-tube boiler which I am specifying for the beginners' engine is based on a considerable amount of experimenting which I did a good while ago. Before going into details of it I thought that maybe a little dissertation on the evolution of this type of boiler might be interesting to readers who are new to our craft, so here is a brief history.

Around the turn of the century there was an enthusiastic locomotive-builder who did not care for the amount of work involved in building regular locomotive-type boilers with internal fireboxes and tubes. At the same time he realised the shortcomings of the "pot" boiler, which was easy enough to make, being merely a plain tube with closed ends, and which was heated by three or four spirit-burners underneath, but the flames could be deflected by a slight puff of wind, or even by the movement of the engine itself. The result was loss of steam.

This enthusiast, Fred Smithies by name, started in to design a simple type of boiler that was windproof, and also a good steamer. He tried adding various kinds of flame shields to the plain boiler barrel, and he tried enclosing the burners in a kind of firebox casing under the barrel, with a duct or flume leading from it to the front end. A vertical tube went through the barrel at that point, and the chimney was fitted on top of it.

By discharging the exhaust steam into the tube, a draught was created which sucked the flames along the duct. This boiler was a great improvement on the open-flame type, but the heating surface was limited to the space enclosed by the firebox casing and the duct.

Suddenly Fred got the idea that if he put the "pot" boiler inside the shell of an ordinary locomotive-type boiler, the whole problem would be solved at one fell swoop. The burners would be completely shielded, and the whole of the boiler-barrel would be in the hot gases, so should steam well. He tried it out, and it worked. The boiler-barrel projected through a hole in the backhead of the shell, and the fittings were attached to it direct. The front end of the barrel was supported by a stud.

Various improvements were added. Fred put three water-tubes in the bottom of the barrel. These were bent up at each end, and fitted on the slant, to increase heating surface and help circulation. The barrel was attached to a cast backhead which did away with the need for a front end support.

Anyway, to cut a long story short, Fred applied his boiler to a small four-coupled tank engine with a single cylinder. This "astonished the natives" by running for about an hour on a small continuous indoor track, hauling one coach. It was an outstanding performance for those days!

Variations and developments

The idea was soon adopted commercially, and "internally-fired" locomotives soon appeared on the market. Also there was the usual batch of "I-thought-of-it-first" merchants, one of whom claimed to have converted —some ten years before—a locomotive built by Stevens' Model Dockyard of Aldgate! Some of the firms producing the commercial locomotives with the Smithies boiler added variations, such as a larger number of smaller water-tubes, and a cast backhead with a water space cored in it, into which the tubes were fitted at the back end.

I had plenty of experience with the boilers, and found out a lot about them. A friend bought one of the commercial engines and after a while it became a very poor steamer. He asked if I would fit an oil-burner to it, to ginger it up a little.

I did so, and on trying it with the oil burner, one of the watertubes burst. The makers had fitted seven $\frac{5}{16}$ in. water-tubes under the barrel, practically touching, and with very little slant. In fact the front ends of the tubes were touching the barrel for 3 in. or so before turning up at the ends to enter it right at the front end.

What happened was that, owing to the bad circulation, four of the tubes had become choked with scale and dirt at the firebox end. This was the cause of the bad steaming with the original spirit-lamp. The water-tube which burst was choked solid, and the intense concentrated heat of the oil-burner which I fitted just melted it.

Another firm fitted cast backheads with a narrow water space at the bottom. This also became choked with "fur" like that sometimes seen in domestic kettles. It blocked the ends of the water-tubes, and they just burnt out.

Although the boilers would steam, they were very inefficient owing to the enormous amount of heat wasted through the outer casing. The "heating surface" of the casing was much greater than that of the actual boiler! The only paint that would stand up on the casings was the black heat-resisting kind at one time used for the exhaust-pipes of motor-cycles. The usual coloured paint burnt off at the first time of lighting-up.

An improved version

So far I had taken very little interest in the water-tube boiler, as I much preferred the regular locomotive-type. Then a circumstance arose which altered matters. The boilers of the locomotives made by one firm were provided with what their designer called a "downcomer." This was a flat rectangular casting with a curved flange which was attached to the barrel at the firebox end. It was hollow, and the rear ends of the water-tubes were attached to it. Water flowed into the downcomer through holes drilled in the underside of the barrel, thence through the tubes to the front end.

A correspondent who wrote to me about rebuilding an engine built by this firm said that the downcomer was choked with scale. I wasn't surprised in the least; but although I didn't favour the water-tube boiler, I appreciated that it had good points and was easy and cheap to construct, so thought maybe I could eliminate the sources of trouble.

I did a bit of experimenting, and the boiler specified for *Rose* incorporates the improvements that I tried out all those years ago. The backhead is made hollow, so that the whole surface is available for fittings, just as in a regular locomotive-type boiler, but instead of being cast, it is made from sheet copper and brazed.

A hole is cut in the inner plate and the barrel brazed into it. The water-tubes are fitted at the bottom, and have a good slope, like those of a Babcock and Wilcox stationary boiler. Also, they are quite straight; bends are eliminated by fitting them in the underside of the barrel in the manner devised by the late Tom Averill.

In districts where the water is bad, and scale is likely to form inside the boiler, a washout plug can be fitted at the bottom of the backhead, and the boiler regularly cleaned out. A screwed plug can also be fitted in the backhead opposite the end of each tube, and by removing these when washing out, a stiff wire with a tuft of flax at the end can be pushed right through and the tubes thus thoroughly cleaned.

Another objectionable feature of the spirit-fired boiler was the unpleasant fumes caused by the wicks burning in the confined space. This gained the nickname of "poison-gas plants" for the engines. As a matter of fact the unburnt vapour *is* detrimental to breathe, though not lethal, and will make the driver's eyes smart and water badly. I found that by fitting a blower and arranging the blastpipe and chimney just as in a coal-fired boiler, enough draught could be induced through the firebox to ensure complete combustion of the spirit.

This not only got rid of the fumes, but improved the thermal efficiency, as all the spirit was burned instead of some being evaporated unburnt. The efficiency was also much improved by the extra heating surface afforded by the lower part of the water-space backhead. Regarding heating surface, may I call the attention of beginners to the fact that it is not so much the *amount* of heating surface that makes a boiler steam, but the degree of heat applied to it? *Rose's* boiler will steam very well with the specified burners, but not with a candle in the firebox!

BOILER SHELL OR CASING

The best material for the casing of any water-tube boiler is sheet steel, which doesn't conduct the heat away like brass and copper. Steel tube can also be used for a small casing of the size shown, and if a piece 2½ in. dia. and 22-gauge is available it will save making a longitudinal seam. Square off the ends to an overall length of 10 in. then saw across, split and open out to form the firebox as described for *Zoe* last week.

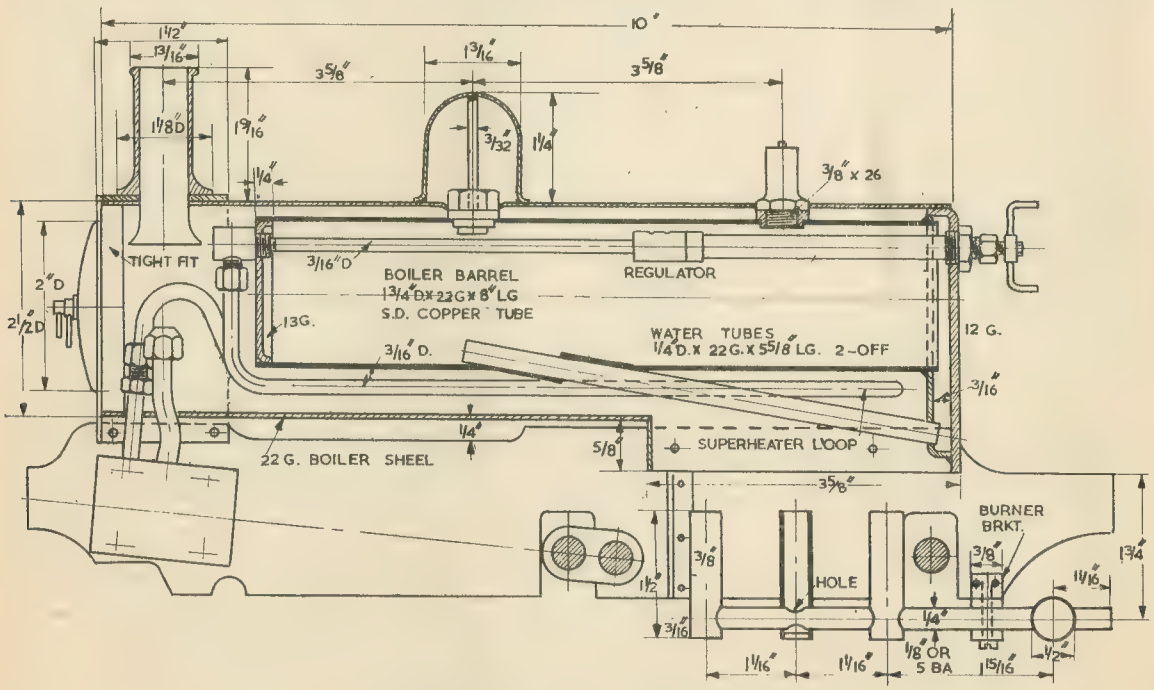
If made from sheet, a piece 10 in. × 8¼ in. will be needed. At 3½ in. from one end of each longer side, make a sawcut or a snip with shears, 1 in. long. Bend to a 2½ in. circle and put a few rivets through the overlap on the longer side of the snips (use 1/16 in. iron rivets) then open out the metal on the shorter side of the snips, to form the firebox, the shape of which is shown in the cross-section. Fit a throatplate in the way described for *Zoe* but there is no need to braze either the longitudinal seam or the throatplate joints. The riveting will be quite sufficient as there is no water in the shell.

The smokebox wrapper is a strip of 16-gauge steel 1½ in. wide, bent to the same shape as the firebox, and fitted over the front end of the barrel. Note—it must be left overlapping the front end of the barrel by 1/16 in. so that the front will fit in flush. Attach the wrapper to the barrel by three 1/16 in. rivets at each side just above where the wrapper diverges; see smokebox end view.

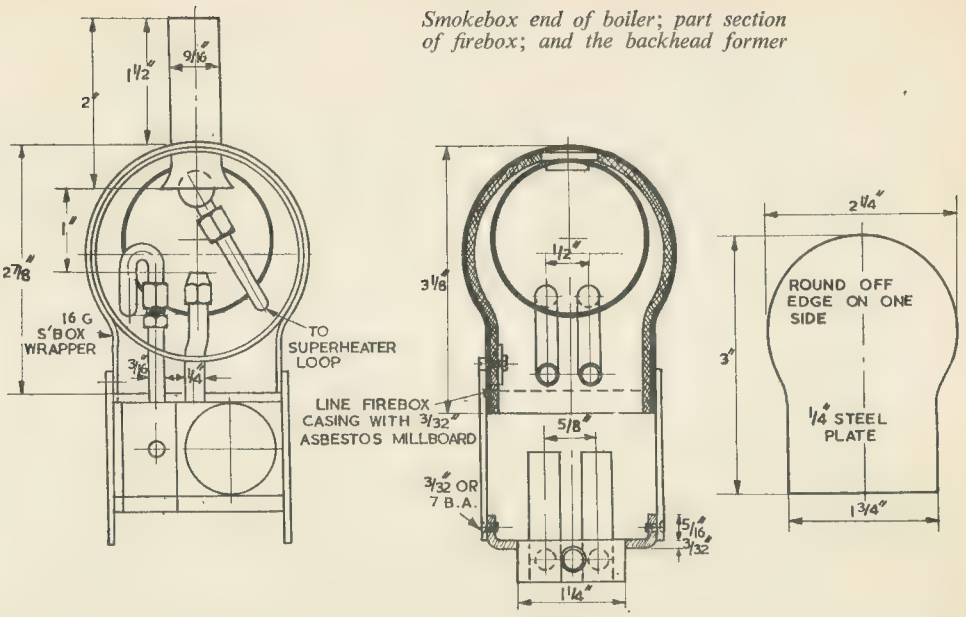
The smokebox front has a dummy door and adornments. It can be a casting or built up. If cast, it will only need the flange turning to a tight push fit in the barrel, and the sides trimming to fit flush in the wrapper. To build up, cut a plate of 16-gauge sheet steel, to fit inside the projecting part of the wrapper, butting up flush against the end of the barrel. The flange which fits inside the barrel is just a ¼ in. strip of 16-gauge steel bent into a ring which will fit tightly in the barrel, and brazed to the front plate.

Tip—leave the front plate oversize until the ring is brazed to it, then file to the outline of the ring, so that when the ring is inserted in the barrel, the plate goes in flush with the wrapper. The door can be dished and turned from a 2 in. disc as described for other engines in these notes, and attached by a screw in the middle. Make the screw from a bit of ¼ in. round steel, and turn the head to simulate the handles. Fix with a nut on the inside.

Scribe a line along the top of the shell; make sure that it *is* on top, or



Arrangement of boiler, pipe connections and burner



Smokebox end of boiler; part section of firebox; and the backhead former

the chimney and dome will be "all cockeyed," as the kiddies would say. At ¾ in. from the smokebox end drill a 9/16 in. hole and fit a 2 in. length of 9/16 in. thin brass or copper tube in it. This should be belled out at the bottom, and project 1½ in. above the barrel. Silver solder it in. For the dome and safety-valve bushes, drill ¾ in. holes along the scribed line at the spacing shown.

BOILER

First cut a forming plate to the size given, then cut out a piece of 12-gauge or 13-gauge sheet copper to same shape but 7/16 in. larger all around except at the bottom. Flange this over the former as described for *Zoe* and file off any raggedness. Cut a piece of 16-gauge copper to fit inside the flange, and bend it over at the bottom as shown in the section. This serves as a foundation ring. Cut a hole 1¾ in. dia. in the upper part, to within 1/16 in. of the top. Fit the plate inside the backhead flange flush with the edge of it, and braze it in.

This job can easily be done with a one-pint blowlamp or a small gas blowpipe. Just lay it on the coke in the brazing pan, cover the joints with wet flux, heat all over till the coke glows and the flux fuses, then concentrate the flame on one bottom corner. When bright red, apply a piece of easy-running brazing strip, which should melt and run in the joint. Then work right around slowly, feeding in the brazing material as the metal reaches the bright red heat.

Run a good fillet along the bottom. When through, let it cool to black, then pickle, wash off and clean up as described for *Zoe*. Coarse-grade silver solder can be used if desired.

Drill two ¼ in. holes in the plate just off the bottom and at ½ in. centres for the water-tubes, then fit the barrel. This is a piece of 1¾ in. × 22-gauge seamless copper tube squared off at the ends to a length of 8 in. Don't use thicker material or the boiler will lose efficiency. Fit it in the hole in the plate, setting it square with the backhead, and silver solder it in, using coarse-grade silver solder. Before putting in the pickle, heat the whole length of the barrel to medium red, as it must be soft for fitting the water-tubes.

Next locate the holes for the safety-valve and dome bushes on the barrel from those in the casing. Push the backhead-and-barrel assembly into the casing leaving the backhead projecting 1/16 in. Scribe circles on the barrel through the holes in the casing, centre punch the circles, and drill 3/16 in. holes, opening them to 31/64 in. and reaming ½ in. If you try to drill direct, the holes will be polysided in the soft thin metal. Turn up bushes to suit from ⅝ in. rod (I always use copper for boiler bushes), tap them ⅜ in. × 26 and fit them.

The front plate for the barrel is made exactly the same as the smokebox tubeplate for *Zoe* but to given sizes. It should fit the barrel tightly. At 3½ in. from the front end on the underside of the barrel, drill two ¼ in. holes, at ¼ in. each side of the centre-line. Put a piece of ¼ in. steel rod in each in turn, and force it down on to the barrel until it assumes the slant of the water-tubes.

This will distort the holes so that the water-tubes—pieces of ¼ in. × 22-gauge copper tube 5⅝ in. long—can be inserted as shown in the longitudinal section. The whole bag of tricks—bushes, front plate and water-tube joints—can then be silver soldered at the one heating. For this job use best-grade silver solder, or Easyflo and the special flux sold for use with it. Pickle, wash well, and clean up ready for attachment of the fittings, but don't fit the boiler permanently in the casing yet.

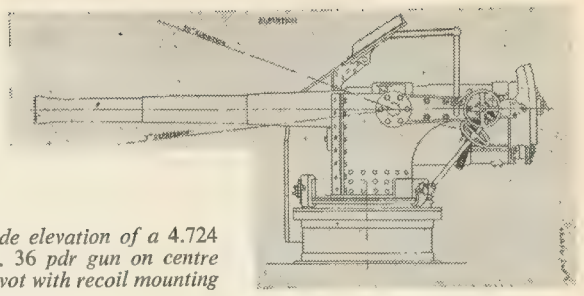
To keep the heat in and preserve the paint on the outside of the casing, the firebox end should be lined with asbestos millboard. This serves the same purpose as the firebrick lining on full-size stationary water-tube boilers. Cut a piece 3½ in. wide, and mould it to the inside of the casing, as shown in the section at firebox. This is easily done if the material is dipped in water, which renders it flexible. If it is bent dry, it will crack and break.

To keep it in position, cut two thin strips of iron or tin about ⅜ in. wide, put one along each side on the asbestos just above the bottom of the casing, and secure it with three 3/32 in. screws put through the lot—casing asbestos and strip—and nutted on the inside of the firebox. When the asbestos dries out it will set quite hard and prevent undue waste of heat through the casing. Next stage, the fittings for backhead and smokebox.

● *To be continued*

The RIFLED GUN

A review of a half-century of development by J. Pearson



Side elevation of a 4.724 in. 36 pdr gun on centre pivot with recoil mounting

THE start of the Crimean War saw the beginning of a contest between guns and armour. Russian guns firing shells at the Battle of Sinope destroyed a Turkish fleet of seven frigates. But they destroyed more than that . . . those guns heralded the banishment of the wooden ship for ever from the fleets of the world.

The rifles of the day had a longer range than the cannon, and the gunners were in danger of being picked off. Range had to be increased, and this could only be done by rifling—the size of field guns was, of course, limited.

Rifled guns had been tried, but had never been successful, though the Lancaster gun was used with some success during the war. The Lancaster was not a true rifled gun, but the bore was oval—in a long spiral—and an oval shell was fired. It rotated with the spiral, and this gave increased range and accuracy. Unfortunately, however, it had a tendency to jam the shell in the bore and so burst the gun.

Towards the end of the war Mr (later Lord) Armstrong proposed the building of a true rifled gun on the polygroove system (a number of shallow grooves with a uniform twist) and made of cast steel.

Since the casting of steel was little known, the guns were eventually made of wrought iron built up from tubes shrunk on to each other; the breech was hollow and closed by a plug—dropped into the breech from above—which was held in place by a screw (actually a threaded tube) working on the inside of the breech. Some of the guns had two handles, others one, to wind up the screw.

The defect of this gun was that it could be fired before the breech was properly closed. When this happened the breech plug blew out, disabling the gun completely until another plug was inserted. However, this incompetency was not officially condemned until the bombardment of Kagosima in 1863. During the heat of the action every gun on the flagship was so disabled, prompting Admiral Sir L. Kuper to write a very adverse report, which eventually caused the breech-loader to be declared unfit for further use or service.

At the same time as the Armstrong gun Joseph (later Sir) Whitworth proposed a gun somewhat similar to the Lancaster gun. His gun had a hexagonal barrel and fired a hexagonal bolt which looked something like a piece of twist drill. The gun, of course, was rifled to match the bolt (it was solid and could be of different weight according to the length of bolt). During trials an 80-pdr bolt went right through the 4½ in. armour of a floating battery !

While this gun was being developed HMS *Warrior* was launched (1860), and it was evident that heavier guns than the current 64-pdr smooth-bores were needed to penetrate armour. It must be borne in mind that the idea of a shell penetrating and then exploding had not then been thought of, and penetration was left to solid shot—so guns firing 100 and 150-lb. balls were ordered. Only the 100-pdr gun went into service and was almost immediately made obsolete by the the new breech-loaders. These were the 7 in. (110-pdr), 40-pdr, 20-pdr, 12-pdr, 9-pdr, and 6-pdr.

Success for Armstrong

In 1863 a trial between the Whitworth and Armstrong guns (both breech- and muzzle-loading rifled guns) resulted in favour of the Armstrong method of building, though in production cast steel was not used. The tubes were made of wrought-iron bars, wrapped while red hot round a mandrel (like a spring), welded together, machined to size and then shrunk on; this same method was used even when steel became available.

At this time, when the advantages of rifling were self-evident, efforts were made by all countries to rifle the large stocks of smooth-bores. The participants of the American Civil War were foremost in these attempts, but they met with little success. (In one action all the bored-out guns in the fleet burst !)

Then success was achieved by a Mr Palliser and a Mr Parsons in England—one using a liner of coiled wrought iron and the other a steel tube. These were the only methods by which smooth-bores were wholly converted.

Shortly after the bombardment of Kagosima the 7 in. and 40-pdr breech-loaders were abandoned, rifled muzzle-loaders succeeding them. At the time of this decision the breech-loader was inferior to muzzle-loader except in range and accuracy: they were slower firing, due to the method of closing the breech; they were harder to repair and keep in working order; the vent pieces often blew out in action because the breech was not fully closed; and, finally, they were more expensive to buy and keep supplied with ammunition.

However, this position did not last more than about ten years, and the Navy clung to muzzle-loaders long after they became inferior to breech-loaders. In deciding on the use of muzzle-loaders one great disadvantage had to be accepted—excessive windage. The shells were fitted with studs to engage in the rifling, the gas escaping round the shell and the rifling being on the shunt system.

In this, each groove was in two parts, one shallow and the other deeper. When loading the studs engaged in the deep groove, and when fired were forced over into the shallow grooves, which helped to centre the shell and increase range and accuracy. The studs were sometimes snapped off by being forced too far over and then, of course, the range and accuracy were hopelessly impaired.

Another effect of the windage was that the hot gases wore the rifling more than they would otherwise have done, with a continuous reduction in range and accuracy. After various experiments to correct this, a gas check suggested by Armstrong's company was adopted. It consisted of a saucer-shaped copper disc (concave side

facing the charge), which was fastened to the base of the shell; firing expanded the copper to fit the bore, and the rifling cut into it, helping the rotation and preventing the hot gases escaping.

The shunt system—used only for the first RML 64-pdrs on the Armstrong system—was very soon abandoned and several others adopted, the Plain, Woolwich, French, French Modified and Maitland all being used.

In the year after the 64-pdrs were adopted—1864—7 in. (6½ ton) guns, 10 ft 5¼ in. long, were manufactured; these fired a solid shot of 115 lb. Soon afterwards the 9 in. (12 ton) gun, with a shot of 256 lb. came into use; then in 1868 came the 10 in. (18 ton) with a shot of 410 lb. Two years later the 12 in. (25 ton) gun appeared, firing 614 lb., followed in 1871 by a second 12 in.—but of 35 tons and a projectile of 820 lb.—and then, in 1878, by the 12½ in. (38 ton), also firing 820 lb. These were all rifled on the Woolwich system.

A year later, a still larger gun was experimented with. It was a gun of 80 tons with a bore of 14½ in. Later this was increased to 15 in., and finished with a bore of 16 in. Originally rifled on the Woolwich system it was finally rifled on the Maitland, firing a shell of 1,700 lb. Its range was about seven miles.

This was the Navy's largest muzzle-loader. Two were used in each of HMS *Inflexible's* two turrets though four 100 ton (17.72 in.) were used in two coast-defence batteries—two guns at Malta and two at Gibraltar.

Improvements in guns necessitated improvements in the carriages. Large pivot guns had been mounted on slides and racers for many years and with the advent of the 68-pdrs and the 7 in. guns they also were mounted on slides and racers. These first mountings were very like the old truck carriages, but had iron-faced blocks instead of trucks to work on metal slides. On both the front and rear blocks were two small trucks which could be raised or lowered at will to ease the work of running the gun out—or in if the gun was being used for dummy practice. Compressors (a cramp) were fitted to grip on the slides to give resistance to the recoil, but these mountings were soon replaced by carriages entirely of iron.

Another innovation in these carriages was the Elswick plate compressor. In this, five short plates some 6 in. deep were attached to the bottom of the gun; the slide had six plates 6 in. deep for its full length, and the plates on the gun were fitted between these. On each side of the slide plates was an arm working on a screw so arranged that turning a lever gripped or released the plates.

This, of course, altered the friction on the plates to allow for the absorption of the recoil, and allowed the gun to be run in and out easily for practice, and for the adjustment of different charges. In both these types the gun was elevated by an early type of quadrant working on a pinion; for the first type the quadrant went round the bottom half of the gun, in the second an arc was bolted on one side.

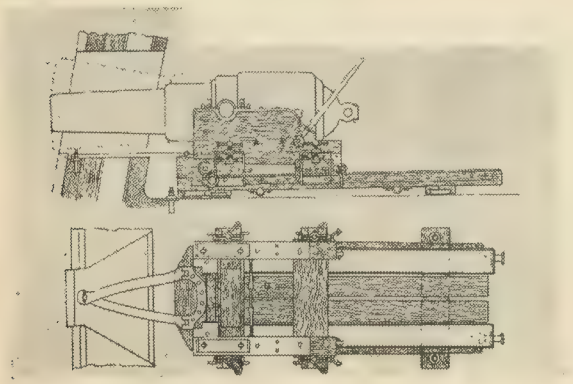
A defect of this mounting was that the recoil tended to overturn the gun. But an improvement was later devised by Admiral Scott in which the mounting was longer and lower and a bow compressor was used. The bow compressor was fitted to the outside slides of the mount (it was practically a G cramp), and was also adjustable by a disc on the screw.

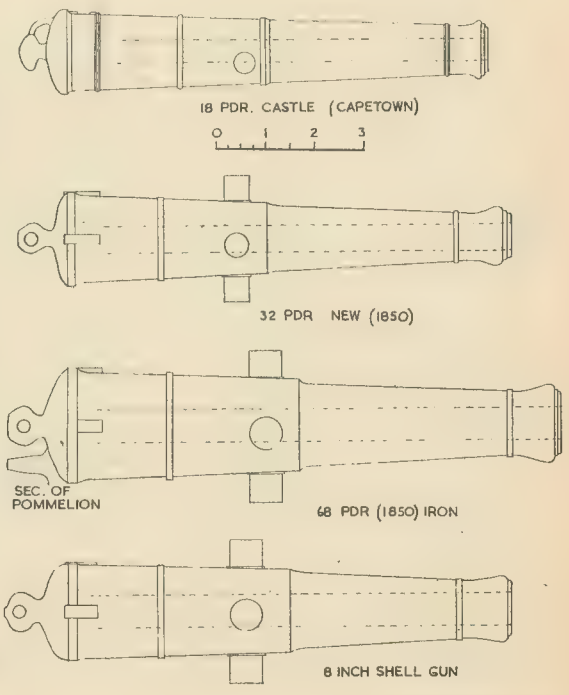
Two hydraulic buffers also assisted in absorbing the recoil; later the hydraulic buffer, in one form or another, entirely superseded all other types of compressor.

While England clung to the short-muzzle loader, other countries persevered with the breech-loader. France did not make muzzle-loaders after the 1860s, and, in consequence, England was outgunned and outranged. Fortunately, Lord Armstrong had established a gun factory at Elswick, and, supplying foreign countries, had kept abreast of, if not in front of, developments in other countries.

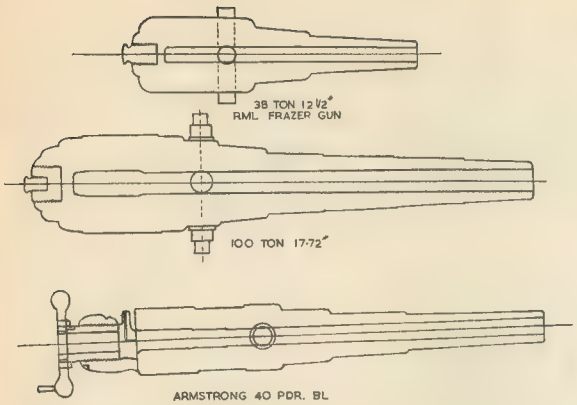
Experiments conducted at Elswick with the instantaneous small-grain powder then in use in muzzle-loaders showed that the pressure on the shell lessened as it went up the barrel, this being due to the fact that on ignition the powder instantly turned to gas, and, forcing the shell up the barrel, gave itself more room to expand.

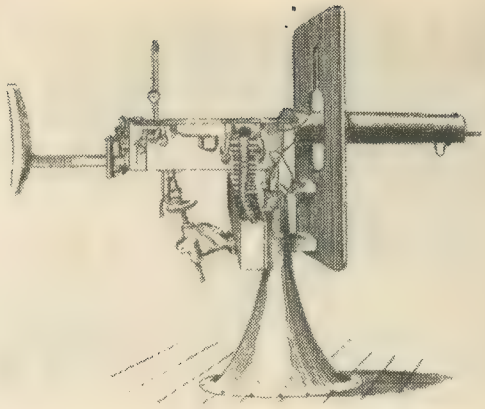
Using a large-grain, slow-burning powder the pressure was increasing since the powder was still turning to gas while the shell went up the barrel —which, in turn, gave a higher muzzle velocity with longer range and better penetration of armour. However, in the short-barrelled muzzle-loaders the shell left the barrel while the powder was still burning, and most of the





Below: A 100 pdr smooth-bore gun mounted on a wooden carriage and slide, with, below it, a wooden slide for a heavy gun





A Maxim gun on a naval mounting

advantages of the slower-burning powder were lost.

This power was put to good use in the longer-barrelled breech-loaders. Technical difficulties—mainly the impossibility of increasing the size of turrets or the width of ships to allow of the guns being loaded in the turrets or inside the ships—prevented any increase in the length of muzzle-loaders.

Since the breech had by now been improved and made impossible to fire prematurely (it was now closed on the French interrupted screw system), Lord Armstrong at the close of experiments in 1878 urged these conclusions on the Government. To test these results officially he lent a 6 in. and 8 in. gun.

In 1880 breech-loaders were finally adopted; the increase in muzzle velocity was from 1,600 to 2,000 ft a second.

It is as well, at this juncture, to note another new advance in gun-founding technique at Elswick. This was the wire-wound gun.

Wire-wound guns had been advocated by a Mr Longridge during the Crimean War, though nothing was done about it at the time. But between 1875 and 1879 Elswick constructed some 40 guns on this principle. Manufacture was then discontinued; they were slower-building and more expensive, and the old type had ample strength to withstand the pressures then in use. By 1887 new powders with increased pressures necessitated wire-wound guns, and these were generally adopted.

Of the guns at this date—1890—the following were the lengths (calibre is also given, since the length of the guns was continually increasing, and calibre gives a clue to length), and the ships in which these guns were mounted: 4 in., 10 ft, wire 4 in., 13 ft 9.6 in., 40 cal.,; wire 12-pdr, 10 ft. 3.6 in., 40 cal.; wire 4.7 in., 16 ft 2 in., 40 cal. in *Nile*, *Trafalgar*, *Barfleur* and *Centurion*; 6 in., 14 ft 5.5 in., 26 cal.; wire 6 in., 20 ft 9 in., 40 cal.; 8 in., 21 ft 2.5 in., 29.61 cal., Severn-class cruisers; 9.2 in., 25 ft 10 in., 31.5 cal.; wire 9.2 in., 32 ft, Powerful-class cruisers; 10 in., 28 ft 6.4 in., 32 cal., in *Centurion*, *Barfleur*, *Renown*, *Sans Pareil* (stern-chaser only); 12 in. 45 ton, 27 ft 4.5 in., 25.2 cal., in *Colussus*, *Edinburgh*, *Collingwood*, *Hero* and *Conqueror*; wire 12 in. 46 ton, 37 ft 3 in., 35.4 cal., in Majestic and Canopus classes; 13.5 in., 36 ft 1 in., 30 cal., in *Royal Sovereign*, *Nile*, *Trafalgar*, *Anson*, *Howe*, *Rodney* and *Camperdown*; 16.25 in., 43 ft 8 in., 30 cal. in *Benbow*, *Victoria* and *Sans Pareil*.

Experiments with powder still went on in an effort to increase pressures and muzzle velocities as each increase in penetration was met by thicker armour, better armour, harder armour. Guns were chambered to allow of higher charges without increasing the length of charge (this would be equivalent to a reduction in the length of calibre), and powder was mixed so as to make it into small squares to increase the time of burning, then into large hexagons.

At this stage it was discovered that the powder was burning irregularly; this was found to be due to the powder burning only on the outside, and the hexagons were given holes in the centre to even out the rate of burning. Just before 1890 cordite was discovered. This, of course, gave higher pressures for much smaller charges and simplified loading because of the shorter case needed for a cordite charge as against powder. But its chief usefulness was its smokelessness.

Small smokeless charges were sorely needed for the new quick-firing guns which had been developed to meet the menace of the torpedo-boat. With the old powder charge a high rate of fire could not be maintained since the gun soon masked itself with the smoke of its own discharge.

Most of the speed of the quick-firers was due entirely to the method of loading; the difference in the charges was: 6 in. gun, powder 55 lb. in a case 38 in. long; cordite 15 lb. in a case 23 in. long, which made loading much easier. Under the old system loading was by separate charge and shell, and, since the charge was in a silk bag, the gun had to be sponged out between each shot. With the new method, charge and shell in one and the charge in a copper case, sponging was dispensed with, and one motion loaded charge and shell.

In addition, the cartridge case prevented the escape of gas to, or through, the breech, which had previously been done by what was known as the Elswick Cup system. This consisted of a copper saucer, concave side to the muzzle, and expanded on to a copper ring in the gun to prevent the gas escaping rearwards.

However, it had a tendency to jam and was easily damaged, and so was given up in favour of the De Bange Pad (named after the inventor). This was a cushion of asbestos soaked in tallow, the whole being fastened to a metal plate on the breech block. It was easy to maintain, and could be brought back to shape when softened by the heat of prolonged firing by placing in a bucket of water.

The first quick-firing gun (of small calibre) was the French Mitraulleuse, used in the Franco-Prussian War of 1870. Other guns soon followed, of which the following were the chief: Gatling, Gardner and Nordenfeldt.

The famous Gatling gun was used by the Navy. It had ten barrels revolving about an axis; rate of fire

was 600 rounds a minute, but it was liable to jam and the crank made accuracy difficult. One, two or five barrels, side by side, were used in the Gardner, which took the place of the Gatling; rate of fire was 120 rounds a minute per barrel.

Almost as soon as the Gardner had been adopted it was superseded by the Nordenfeldt; this also had five barrels, side by side, and the same rate of fire, but the mechanism was simpler and easier to maintain. Next in the field was the Maxim, which, since it was gas-operated, was easier to fire. It was also steadier and more accurate, and soon cleared the field of its competitors. The Maxim was used as an anti-torpedo-boat gun, but a steady increase in size of the torpedo-boats soon made heavier guns a necessity.

These guns were rifle-calibre, but two heavier guns on the same principle were the Nordenfeldt 1 in. and Hotchkiss 37 mm. The former fired a solid bullet, and the Hotchkiss a shell. Both at this time, during the 1880s, were considered heavy enough to stop torpedo-boats, but as these kept on getting larger, heavier quick-firing guns were again needed.

Quick firers

To meet this demand both firms produced 3 lb. and 6 lb. quick-firers, but on account of the size of the guns hand-loading was substituted for automatic loading—though the success of cartridge cases for the machine-guns kept them in use for the heavier guns.

Both types of 6 pdr (25 rounds a minute) were used in the Navy, but only the Hotchkiss 3-pdr (30 rounds a minute) was accepted. A simpler type of breech-block, hinged at the bottom so that it fell downwards on opening, increased the speed of firing; the mountings of these guns were made by Armstrongs.

By 1887 a still more powerful gun, the 4.7 in., firing a 45 lb. shell at the rate of ten a minute, had been produced. During a test this new gun fired ten rounds in 47 seconds while the ordinary service 5.5 in. took five minutes seven seconds for the same number of rounds. Later a 5.5 in. quick-firer with a 70 lb. shell and a 6 in. with a 100-lb. shell were produced but were not adopted until after the discovery of cordite because of the impossibility of firing anything like this number in the time aimed at a moving object owing to the smoke of discharge.

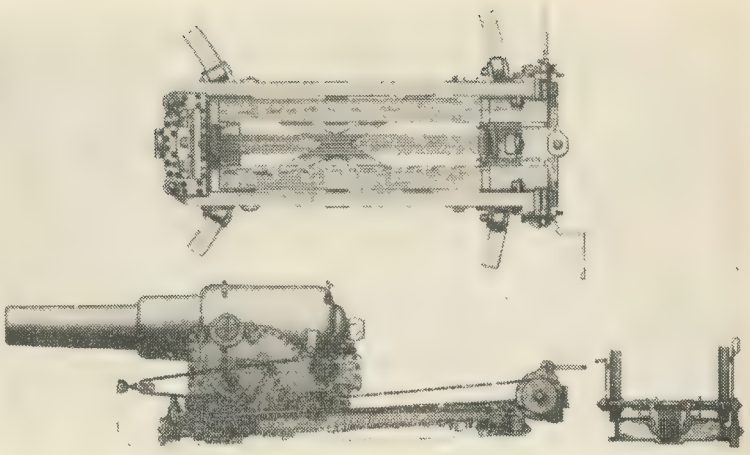
While explosives and guns had improved the mountings had, of necessity, kept pace. Hydraulic buffers had by now superseded all other means of controlling recoil. They were of two kinds: pull-out and push-in (in the former the piston was pulled outwards and, of course, in the other pushed in).

After a while they were combined. One of each type, connected with a bypass which helped to even the recoil, were used; previously two of either type had been used. Scott's broadside mountings had given way to Vavasseur's, the main difference being that the slides were now at an angle of between 10 and 15 deg. (according to the weight of the gun) so that the guns ran out by gravity, and improved the method of training.

Then it was found that these mountings had a serious defect: if the roll of the ship was in favour of the run-out a heavy blow could be given to the mount by the carriage and damage could be done. This was corrected by fitting a hydraulic ram to control the running-out.

The mountings were constructed so that the guns could be dismounted, an overhead crane being provided for each gun. This was because the projection of the guns made it difficult to dock or to come alongside other ships, and watertight ports to grip the muzzles were difficult to make. In addition, the muzzles were liable to corrode if left permanently run-out.

M. Vavasseur's broadside mount did not last long, it being rapidly made obsolete by his centre-pivot mount. In these, the racers, rollers, etc., were self-contained and took up little space. The disadvantage of this mount was that if used between decks a large port was required, or a small arc of training had to be accepted. Originally these mountings had been designed for special places on the upper decks, but their advantages caused their adoption for other places and, naturally, led to the guns being sponsoned out to take advantage of a wide arc of training with small ports when between decks.



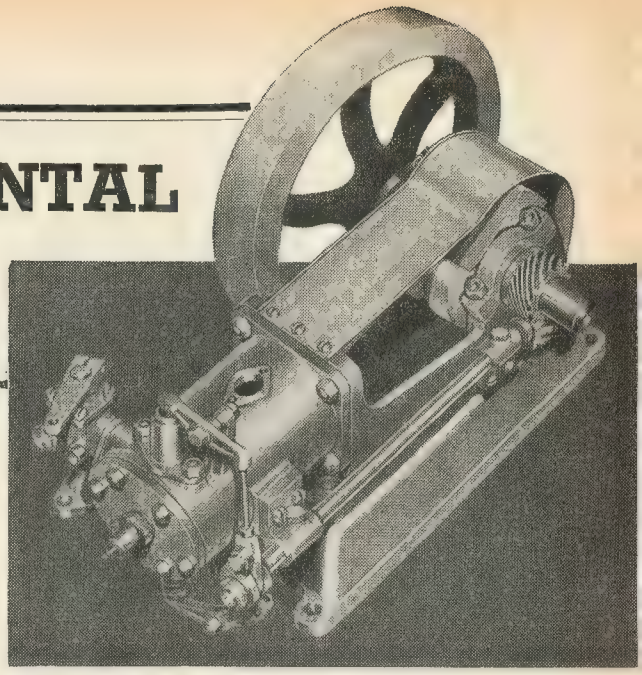
A 7 in. ML gun on naval carriage and slide Elswick plate compressor

All these improvements in guns up to 6 in. led to their use in heavier guns, and turrets were now turned by hydraulics, and shells and charges (still separate in the heavier guns) being rammed home by similar means. Actually this is of little consequence to us, as in modelling larger guns the turrets will mask the details of all but the outside and the gun barrels. For those who might wish to make these details the illustrations of the larger guns should be useful. Turrets and ramming had previously been operated by steam; later electricity was used to do this work.

The shields on these smaller guns were usually double, a thick outside something like an open-ended turret and a thinner straight shield. Attachment to the mount was at first direct, but experience showed that a blow from a shell on the shield was transmitted to the mount, which was then liable to jam. To overcome this fault the shields were bolted to the mount by U-shaped bars; these took the shock of any blow.

From now until the end of the period under review—1906—improvements were only in matters of detail. The modern gun and mount had arrived. There were, of course, improvements in loading, ammunition supply, the use of casemates, shells (shrapnel, common, star-shell, armour-piercing, etc.) and turrets, but we are only concerned with the accurate reproduction of these guns on models, and not with internal details. ▣

A 60 c.c. HORIZONTAL GAS ENGINE—6



By EDGAR T. WESTBURY

Continued from 12 September 1957, pages 368 to 370

Further valve gear details

THE rocker pivots (part No. 25) may be turned from hexagonal mild steel bar, the most suitable size being approximately ⅜ in. across flats, or the nearest spanner size, though personally I have always found it difficult to obtain material which fits any spanner in my possession !

For producing the eccentric shanks, the purpose of which is to facilitate tappet adjustment, I recommend the following procedure. Take a piece of bar long enough to make both pivots, with adequate extra allowance for chucking. This is held in the three-jaw chuck and turned down to the finished bearing surface diameter (¼ in.) for a length of 1¼ in., after which the bar is reversed end for end and the operation repeated at the other end. It is now necessary to set the work over for turning the end eccentrically; the exact amount of offset is not critical, and with some chucks I have met, it would only be necessary to take the job out, rotate it half a turn, and put it back in the chuck again !

But to be serious, a simple method of setting over (provided that the chuck jaws are not worn bell-mouthed) is to insert a slip of packing about 0.020 in. thick between one jaw and the work; note that the amount of offset is *not* equal to the thickness of the packing, but about a quarter to one-third less. The shank may now be turned down and screwed 2 BA, then finally the bolt is parted off.

Alternatively, the eccentric turning may be done as the first operation; but note that the head should be concentric with the pivot bearing surface and not the shank, in either case. A thin washer is fitted to the shoulder of the shank; this should not have the usual clearance but be a snug, if not an actually tight, fit.

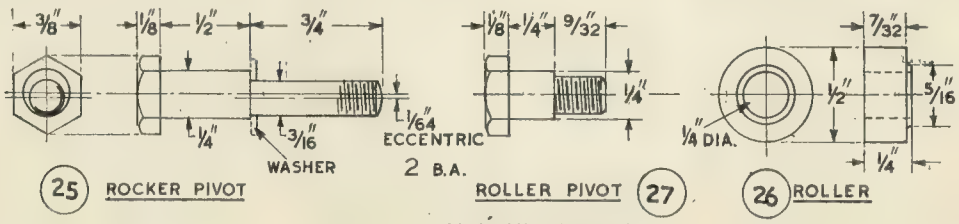
ROLLERS AND ROLLER PIVOTS

The rollers (parts Nos 26 and 27) should be machined all over so as to be perfectly concentric inside and out, and high finish of working surfaces is essential. They should run freely on the pivots, which may be made from the same material as those of the rockers, and the machining is so straightforward as to call for no comment. All these parts should be case-hardened and polished, but the threads should preferably be left soft. Incidentally, the use of roller tappets does not necessarily reduce friction, as they do not always roll in true relation to the cams; but they do creep round and thus distribute wear to a substantial extent.

In order to avoid an excessively long and cumbersome inlet valve rocker, a short push rod is interposed in the operating system, one end being socketed in the recess of the rocker and the other screwed into a rectangular piece terminating in a fork which locates it on the camshaft (part No. 19). The side of the fork is drilled and tapped to receive the roller pivot, and in order to enable this to screw right home to the shoulder, the first thread or so should be counterbored out of the fork piece. It is best to do this before tapping, both to ensure concentric accuracy, and also to avoid the drill or cutter taking charge and clearing the thread away altogether.

Incidentally, it may be opportune here to call attention to the common, and as I believe, pernicious, practice of machining clearance grooves in setscrews and other parts which have to screw up to a shoulder. This is often expedient, and excusable, on parts commercially produced on capstan or automatic lathes, where dies may be damaged by running them too close to a shoulder—provided that these parts are not too highly stressed.

But it cannot be denied that the clearance groove seriously weakens a



small screw, particularly if, as often happens, it is machined with a square-ended tool, so as to produce sharp corners. Moreover, if a plug or cap which is to be fitted with a fibre washer is grooved in this way, the washer is inevitably a slack fit, so that it is forced out of centre when tightened, and often fails to produce a sound joint.

I make a practice of avoiding the need for grooved parts wherever possible, by counterboring the tapped hole or nut; but when a groove is absolutely essential, I machine it with a round-ended tool, and no deeper than is absolutely necessary. Some workers, both amateur and professional, however, turn grooves in screwed parts at the least provocation; I once had some drawings made by a draughtsman of long experience, who insisted on grooves whether they were necessary or not, and strongly resented my disagreement with what he regarded as "standard practice."

The fork piece should fit easily over the camshaft, and the surfaces should be finished so that it works quite freely, the depth in relation to the roller pivot being such that it allows the roller to make contact with the base circle of the cam before bottoming on the shaft. It fits between the cams, which are arranged with the bosses outwards, and a peculiarity of this particular method of assembly is that it does not matter which cam is fitted nearest to the bearing, because the rollers may be located on either side of the fork piece and the exhaust rocker respectively. But obviously, when once located and timed, the arrangement must be adhered to, as the cams themselves, and their angular locations, are *not* interchangeable. Directions for timing the cams will be given later, when dealing with final engine assembly.

INLET VALVE HOUSING

This is specified as a bronze casting (part No. 22), though a good aluminium alloy is permissible, and it is quite easy to machine it entirely from the solid if desired. The lower extension should be machined to a close fit in the bore of the cylinder head, and the lip and seating also carefully fitted to make good contact with the mating surfaces in this bore; the length should be adjusted so that there is a slight clearance (not more than 10 thou at most) between flange faces when fully home. If found necessary, the housing may be "ground in" to its seating in the head, like grinding in a valve, but with good machining there should be no difficulty in making a perfect joint without such measures.

At the same setting as the external machining, the internal drilling of the valve guide, counterboring the port, facing and chamfering, can be carried out, with due care to keep all these surfaces concentric. A pin mandrel may be used to mount the component in the reverse position for counterboring the top end, which must also be concentric with the previously machined bores, and the top flange face, also, if found desirable, the tapered external surface, can be machined while thus set up.

Finally the housing is fitted in position, with the stud holes drilled and tapped, and temporary screws used to secure it for marking out the port in the side to coincide with the passage in the head. It may be found practicable to drill this in position, but generally it will be found more satisfactory to remove it and drill the port undersize, then replace it for finishing with a reamer or D-bit, so that it lines up exactly.

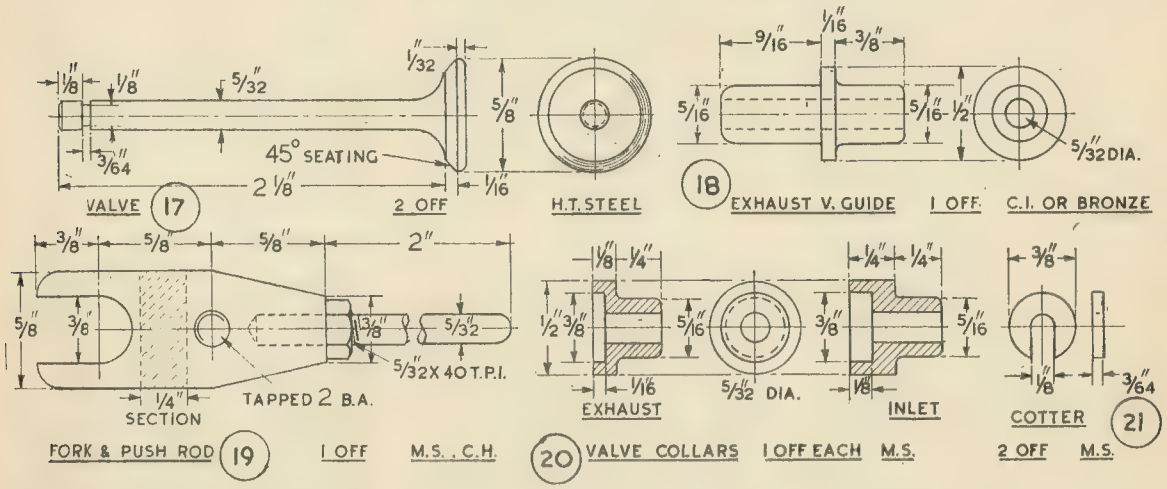
INLET AND EXHAUST VALVES

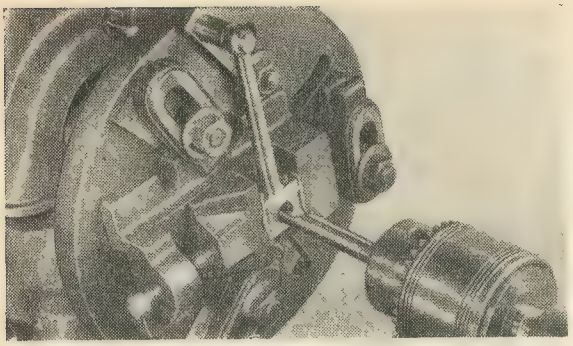
These (part No. 17) are identical in shape and dimensions, and, in fact, may be made interchangeable. The material specified is high-tensile steel, which term embraces any of the usual nickel chrome or similar alloy steels, and an old motor car or diesel engine valve, if not too badly burned, will provide quite suitable material. Note that many valves have only the head made of heat-resisting material, with lower-grade butt-welded stems, so make certain the part utilised for the head comes from the right region.

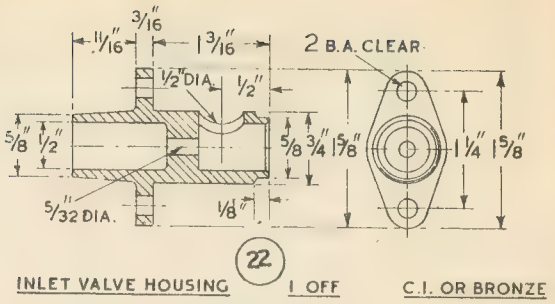
I have found that stainless steel aircraft bolts also provide suitable material; mild or low-tensile steels can be used but are liable to excessive deterioration of the seatings by burning or pitting.

I have on several occasions given instructions for turning valves, an operation which some workers find rather formidable, due to the slenderness of the stems, especially when using tough material. One method I have seen recommended is to turn them in pairs, between centres, by the "back-to-back" arrangement often adopted for making bolts, and finally parting or sawing off between the heads; but I consider that more rigid support can be obtained by holding the material in the chuck and turning one at a time, over all essential surfaces, then parting off.

It is practicable and very desirable to use back centre support, but undesirable to drill the slender stem to take point centres; I prefer to turn down a short length of the stem to the finished diameter, and chamfer the


1/8" 1/8" 5/32" 1/32" 5/8" 45° SEATING 3/64" 2 1/8" 1/16"
VALVE 17 2 OFF H.T. STEEL
9/16" 1/16" 3/8" 5/16" 5/16" 1/2" 5/32" DIA.
18 EXHAUST V. GUIDE 1 OFF C.I. OR BRONZE
3/8" 5/8" 5/8" 2" 5/8" 3/8" 3/8" 5/32" 5/32" X 40 T.P.I. TAPPED 2 B.A. 1/4" SECTION
FORK & PUSH ROD 19 1 OFF M.S. . C.H.
1/8" 1/4" 1/4" 1/4" 1/2" 3/8" 5/16" 3/8" 5/16" 1/16" 5/32" DIA. 1/8" EXHAUST INLET
20 VALVE COLLARS 1 OFF EACH M.S.
3/8" 1/8" 3/64" COTTER 21 2 OFF M.S.





Showing how the crankhead bearing can be machined in position on the connecting-rod, to ensure exact parallelism with the little-end bearing

end to an included angle of 60 deg., to take a hollow centre. This enables the rest of the stem to be machined without difficulty, provided that good tools, properly set, are employed.

Do not forget to leave an ample radius under the head, and to finish the surface as clean and smooth as possible. The seating should be machined with a narrow-nosed tool, the top slide being set over to 45 deg., and a very keen, well-raked grooving tool, approximately 0.050 in. or 3/64 in. wide, used to turn the retainer groove near the end of the stem.

VALVE COLLARS AND COTTERS

The two valve collars (parts Nos 20 and 21) vary somewhat in shape and dimensions, but can be made in the same way from mild steel bar, the spigot end being turned and drilled first, then the piece is parted off and reversed in the chuck for facing and counterboring. It will be seen from the general arrangement drawing that the inlet valve collar forms a kind of trunk crosshead, to give guide support for the valve, consequently the outside of this collar must be machined exactly concentric and fit closely in the hole; if it is made from ½ in. dia. bar, it must be chucked quite truly for the main turning and drilling operations.

An end mill or spot facing cutter may be used to counterbore the recess, which must be exactly square with the bore, and the horseshoe cotter should fit snugly in it. This part may with advantage be made of high-tensile steel as it is subject to heavy shear stress. I make these cotters in half-a-dozen or so at a time—a few spares are always welcome—by turning and drilling an aircraft bolt (RR for preference !), then grooving out the gap with a milling cutter, and finally parting off to the required thickness.

As a result of long experience, I have found this form of spring retainer most satisfactory for all kinds of engines, in conjunction with valve collars having a substantial length of bore and fitting the stems so that they have no tendency to tilt, also recessed so that they trap the cutter positively and securely; moreover, they are the easiest type to dismantle or assemble.

There are, of course, other methods of retaining valve springs which can be employed; in one or two cases I have screwed the valve stems and fitted cap nuts which can be used as a means of tappet adjustment, and these are quite satisfactory provided that they can be securely locked. I am not, however, in favour of any method which involves the need for cross-drilling the valve stem, as the latter is thereby unduly weakened, and the local shear stress on a cross pin makes it very liable to failure.

With regard to valve springs, it is very difficult to lay down a rigid specification, because springs having a given number of turns, of a given gauge of wire, may vary greatly in strength, depending on the quality of the steel, its tempering and pre-stressing. I am often asked to give exact details of springs for a particular engine, but I find it more satisfactory to obtain a selection of springs from a manufacturer and try them out; the one found most suitable is then recommended to the firm which supplies castings and materials for the particular engine, and thereby made available to constructors.

It may, however, be said that for the engine now under discussion, the strength of the valve springs is not at all critical, as they do not have to operate at extremely high speed or to cope with high lift. Springs made of 19-gauge piano wire, $\frac{5}{16}$ in. inside dia. × ¾ in. free length, and with not less than six complete turns, excluding end turns (which should be ground off square with the axis) should be generally satisfactory; no hardening and tempering is necessary with this material.

The exhaust valve guide can be made from bronze or cast iron stick; the latter is preferable as it will work with fine clearance and is largely self-lubricating when once run in with graphited oil. The guide may be machined all over at one setting, ensuring that the bore and external surface are exactly concentric with each other. When fitted, the top end should project into the valve port sufficient to protect and guide the valve stem as much as possible without restricting port area unduly. It does not need to be an excessively tight fit in the head as it is held in place by the valve spring, but it should not be so slack as to allow the valve stem to be displaced sideways under working thrust.

REQUEST ITEM

With reference to machining the connecting rod, I stated that methods had been described in connection with previous engine designs, but readers have reminded me that many constructors may not have access to the issues in which these methods were described, and have asked me to repeat the information, or illustrate the method referred to.

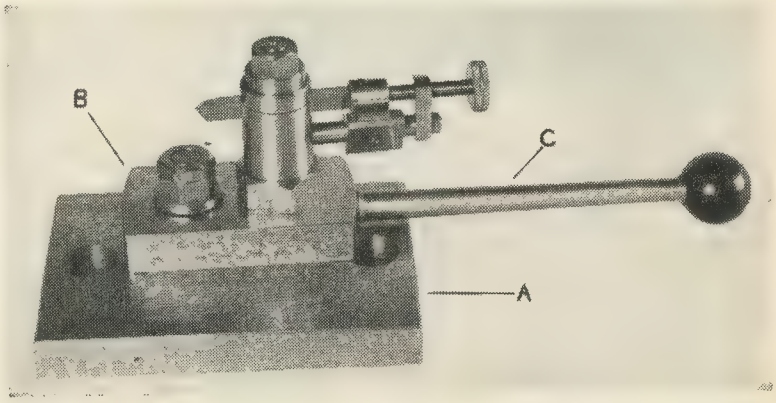
In compliance with this request, I reproduce herewith the photograph showing the set-up for machining the connecting-rod and crankhead assembly of the Neptune diagonal paddle engines, which is the same as the corresponding component of this engine except in detail and in dimensions.

It will be seen that the little-end bearing (previously bored while the rod is in the rough) is located square with the face plate by a pin mandrel, and with the part-machined crankhead brasses bolted in place, the assembly is set up to centre the bearing accurately for boring and facing, then clamped in position by any convenient means. By adopting this principle it is possible to ensure that the crankhead and little-end bearings are exactly parallel all ways.

● *To be continued*

A spherical turning attachment

With modifications, says DUPLEX, this appliance, though built for a Drummond, can be adapted to almost any other lathe



THE spherical turning attachment illustrated in Fig. 1 was built for mounting on the cross slide of the Drummond lathe; but, by making any modifications found necessary for altering the tool centre height or the base plate register tenon, the appliance in its finished form is suitable for use with other types of lathes.

As shown, the cutter is moved over the work on a circular path by means of a long, ball-ended operating handle. However, commercial appliances of this kind, designed for taking heavy cuts in rapid production work, are usually furnished with a worm gear drive for rotating the cutter mounting about a fixed pivot centre; but this addition has been found unnecessary in the present instance where, to obtain an accurate, high finish, light cuts are preferable and, moreover, there is no waste of time in returning the tool to start a fresh cut.

The two machined test pieces illustrated in Fig. 2, when measured with a micrometer, were found to be exactly in accordance with the predetermined diameter, and in addition, the departure from true sphericity, as far as could be measured, did not exceed 0.00025 in.

That the capabilities of the appliance are not restricted to ball-turning is shown in Fig. 3, where examples of internal and external radial form-machining are illustrated, together with the method used for machining a ball thrust race. The latter operation will be found to impart to the ball track a more accurate finish than usually results from taking a plunging cut with a round-nosed form tool.

To finish races machined in this way it has been found that the ball track could be highly polished by lapping the work in the lathe with a stick of hard wood charged with abrasive and supported on the hand tool rest.

THE CONSTRUCTION

The base plate *A* is made from a piece of $\frac{1}{2}$ in. mild-steel plate, 3 in. in width and $4\frac{1}{4}$ in. in length.

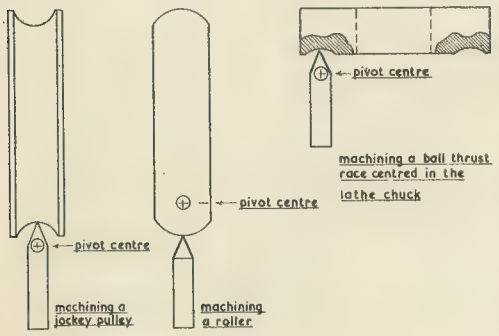
Before the various holes are finally machined to size, the work should be made flat on both the upper and lower surfaces so as to provide a true seating for the tool post base and accurate contact with the surface of the lathe cross slide.

This work can be carried out by filing and finally scraping-in to a surface plate; but if the shaping machine is employed, very little hand work should be required. An alternative way of doing the preliminary machining is to attach the base plate to the lathe face plate and take facing cuts over both surfaces in turn.

Where this plan is adopted, the holes for the passage of the two $\frac{5}{16}$ in. dia. T-bolts should in the first instance be drilled with a No 3 drill and then tapped $\frac{1}{4}$ in. BSF to take hexagon-headed screws that are put in from the back of the face plate to secure the work in place.

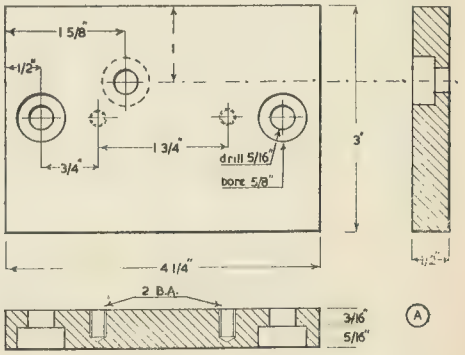
When carrying out this preliminary drilling, the tapping-size holes must be opened out at their mouths to the clearing size, otherwise any larger drill used subsequently will drill off-centre because the point will make uneven contact with the oblique surface of the screw threads.

One advantage of clamping the work to the lathe face plate is that the $\frac{5}{8}$ in. dia. recesses for accommodating the T-bolt nuts can be

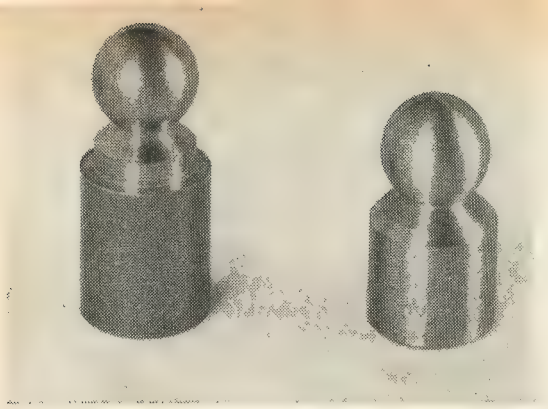


Top, Fig. 1: The finished spherical turning attachment

Left, Fig. 3: Showing three varieties of machining operations carried out with the attachment

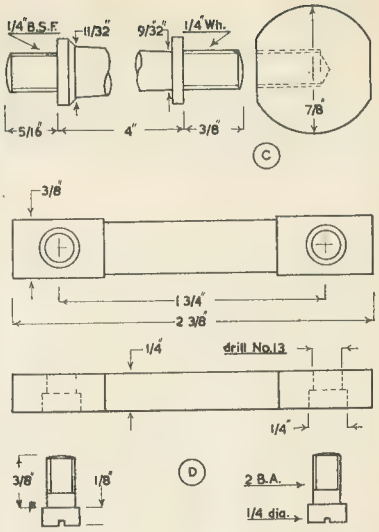


Right, Fig. 4: The base plate



Left, Fig. 2: Sample workpieces

Right, Fig. 6: Operating handle and the base plate guide tenon



machined to size and with a flat seating by means of a small boring tool. For this purpose the work is set up by fitting a peg in the drill hole and centring it with the aid of the test indicator, secured to the lathe saddle or mounted on the surface gauge resting on the lathe bed. In the same way, the recessed bore for mounting the pivot bolt can be accurately located and machined.

Mounting this kind of work in the four-jaw chuck is not always advisable, for even where the part is pressed against the chuck jaws by means of the tail-stock barrel it may lift unevenly when the jaws are fully tightened.

Although a new chuck may be free from this defect, it is liable to give trouble once the jaws become slightly worn and the result then is that the two surfaces of the work will not necessarily be machined parallel. In any case, it is advisable to check with the test indicator the chuck's correctness of holding a test piece of known accuracy. However, where the work is securely clamped to a true-running face plate this difficulty does not arise and parallelism of the machined surfaces is assured.

To obtain even contact with the toolholder base and the surface of the cross slide, the machined base plate is finally scraped-in to the surface plate with the aid of blue marking paste.

Although a hand scraper made from a discarded, fine file is quite satisfactory for this work, the more modern form of tool, consisting of a tungsten carbide tip butt-welded to a mild-steel blade, will retain its sharpness almost indefinitely and will save much irksome resharpening.

To obtain a good appearance, scraped work is commonly given a uniform, frosted finish by plying the scraper diagonally in two directions at right angles to one another. With a little practice the work can be finished by forming a series of crescents or rectangles and, when doing this, the scraper is held to the work with the left hand and guided solely by the right hand.

A brighter finish is imparted to mild-steel work if a solution of soap and water is applied to the surface to serve as a lubricant.

THE TOOL-POST BASE

The base *B* is also made from ½ in. mild-steel plate which is, again, machined parallel by clamping it to the lathe face plate. For this purpose the two bores shown in Fig. 5 are first marked-out and then drilled and tapped ¼ in. BSF for the securing screws.

After the two surfaces have been faced, a threaded peg is screwed into one of the holes and set with the test indicator to run truly; in addition, the work is prevented from rotating by means of a stop bolted to the face plate. With the peg removed, one bore and seating can be finished to size with a small boring tool.

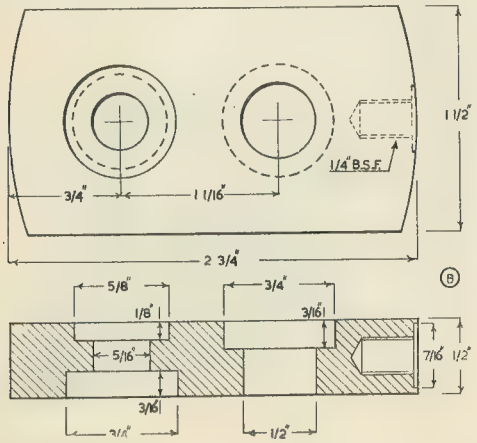


Fig. 5: The tool post base

The second bore is machined in the same way, except that a bolt can now be used for securing the work to the face plate.

The curved ends of the base are machined in turn in the lathe from each of the bore centres distant from the end face of the work, but when doing this the base should be mounted on a piece of thick card to protect the face plate from damage. The two surfaces of the work are afterwards scraped-in to the surface plate and given a frosted finish to match that of the base plate. To finish the base it is drilled and tapped ¼ in. BSF for mounting the operating handle *C*.

The handle is turned between centres and screwcut at either end.

The taper was machined by fitting the tail-stock with the set-over centre described in a previous article; this enabled the automatic saddle traverse to be used instead of having recourse to hand-feeding from the set-over top slide and, by adopting the former method, the need of resetting the tail-stock in accurate alignment is avoided.

The base plate *A* is completed by fitting the guide strip or tenon *D*. This part is waisted and the two end portions are scraped to an accurate fit in the cross-slide T-slots; for, as will be apparent later, the base plate must be accurately located to ensure correct centring of the attachment on the lathe saddle.

The tenon is secured in place by two close-fitting 2 BA screws, which, as shown in Fig. 4, engage in blind holes.

● *To be continued*

POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

OUT OF TOUCH

SIR,—As I have moved away from Vancouver, B.C., to live here in Edmonton, Alberta, I have been right out of touch with any modellers, but I am anxious to contact any who might be living here.

At the moment I have a traction engine on the go, a 1½ in. scale Burrell, single-cylinder, general purpose engine. I am working to drawings supplied by Bassett-Lowke. I would like to finish this as a showman's model, but I am wondering if there is anything in my present drawings that will lead me astray.

Edmonton, Alberta. HERBERT J. REES.

WORTH PRESERVING

SIR,—I am building a 3½ in. gauge model of one of the original NER Class T locomotives, but in correspondence relating to the above I find that almost the whole of the LNER Class D20 locomotives have been scrapped. In fact, only three of the class survive.

In view of the meritorious service of these locomotives in the early part of the century (as NER Class R), surely some steps must be taken to preserve one of them in the original state. I feel positive that the readers of MODEL ENGINEER would give support in an attempt to bring the matter to the notice of the authorities.

Davyhulme, Manchester. F. RENWICK.

BACKGROUND NOISE

SIR,—For the first time I have been fortunate enough to be in London during the Model Engineer Exhibition, so naturally availed myself of the opportunity to visit the show.

While I was not disappointed at the exhibits, which were of an exceedingly high standard, I have one criticism to offer. Is it necessary to keep up an almost continuous blare of canned music over the public address system, which in any case is unsuitable for anything other than "fair ground music"?

I should have liked to have discussed many of the exhibits with the attendants, but with the discordant din rising above the unavoidable general background noise I gave up the struggle after a few attempts.

A later visit with my young daughter to the children's gallery at the South Kensington Museum was almost soothing in contrast.

Newcastle. D. R. GRAY.

WELCOME VENTURE

SIR,—Let me express my great interest in the old time gas engine, Centaur, which Mr Westbury has started. I have always wanted to make such an engine and hope that one of your advertisers will see fit to supply castings. I am particularly interested in a version using glow-plug ignition, or something similar, so that the ignition system remains simple, portable, and in keeping with the prototype.

New Jersey, USA. LAURENCE H. SEIBERT.

AMERICAN "ROCKETS"

SIR,—There are three full-scale replicas of the *Rocket* here in USA. Mr Hempstone Oliver, formerly with the Smithsonian, tells me that of the three, two are operable and located respectively in Ford's Greenwich Village and Chicago's Science and Industry Museum.

The third *Rocket* is a cut-away and I'm enclosing a picture showing it as it stands today here at the James Melton Autorama. The journals for the tender were either lost in shipment or were stolen while the engine was in storage in New York City.

This engine was made in 1930 for the 100th anniversary of the Rainhill Trials of April 1829.

Lake Worth, Fla, USA. HARRY D. ARCHER.

Left: Cut-away model of the ROCKET *at the James Melton Autorama. This is full-scale and was built in* 1930. *Right: This railway illustration was drawn and fixed on tile by Harry D. Archer, whose letter appears on this page*

EXACTLY RIGHT

SIR,—May I thank LBSC and MODEL ENGINEER for the novice's 2-4-0, the design of which is now appearing? It is exactly the kind of engine for a first attempt, and answers my previous queries very well indeed.

I shall hope to build the old engine in 3½ in. gauge, and shall be glad if LBSC can give details of the two-cylinder version for that gauge.

Many thanks for publishing the picture of the Brentwood club's exhibit at St Thomas's Hall. Readers of ME will have noticed Ken Dean's *Petrolea* in the picture. This, of course, is the engine which was very highly commended in the ME Exhibition this year.

The Brentwood club has had a very successful summer season, and has operated at times at a great distance from home! Club members report some most enjoyable days, and some fine performances by the little locomotives.

HAROLD H. ROBINSON.

WINDING ENGINES

SIR,—A few weeks ago there was mention of steam winding engines on the Great Orme Railway.

During a recent holiday I took a photograph of each of these engines, which I think shows quite good detail considering the dark interior of the engine house.

L. H. MANSELL.

Mr Mansell's picture of a winding engine on the Great Orme Railway

SUCCESS STORY

SIR,—After reading, over the last few years, many attacks on LBSC, I think it is time someone showed how our friend has done good in places other than model engineering.

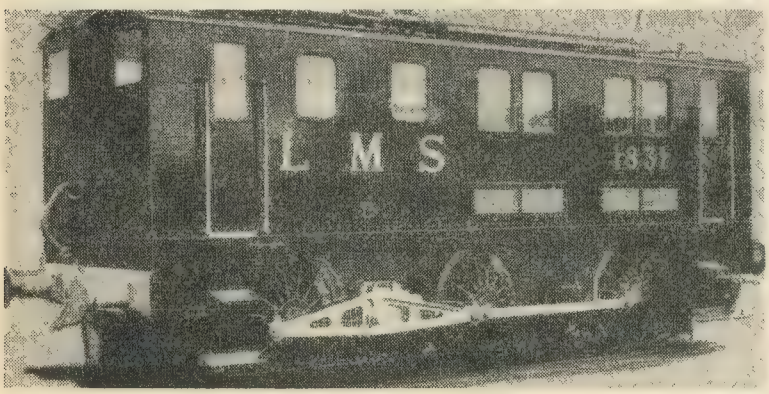
I was 15 when the bug bit me and I started on an LBSC locomotive; at the same time I started as an apprentice in a local engineering works. After that, when the other lads were dodging and playing football, I was nipping into the machine shop doing "foreigners." Naturally, I was always in the foreman's bad books, so imagine my astonishment when I was picked to go as a journeyman apprentice fitter on textile machines.

On showing my surprise, I was told, "We have been watching you making these parts for your locomotive; you are way ahead of the other boys in turning and milling, yet you haven't had any time in the machine shop, so you must be learning at home, and that is the type we want."

On finishing my time as a journeyman fitter, I was offered a job as maintenance fitter in a large textile works. From then on, I was under-foreman, foreman, then overlooker, and now I am inside manager of a factory.

I am still only 27 and I am certain, that, without that extra little something learnt at the pen of LBSC—which, without doubt, is the easiest pen to learn from—I might never have had my start in life.

GRATEFUL.



The first diesel railway engine built by a British railway. It had a Paxman 412 b.h.p. diesel unit which was installed in a 0-6-0 chassis in 1931

FIRST DIESEL LOCO

SIR,—With reference to the model of an i.c. engined locomotive [page 299, August 29], surely this is not an 1831 i.c. engined locomotive, but a 1931 or 1932 design numbered 1831. It was built on the frame of an old Johnson 0-6-0 steam tank engine No 1831.

M. RUSHTON.

The "1831" locomotive is a well-known design, based on the prototype illustrated below. Details were published in 1941.—EDITOR.

EXHIBITION JUDGING

SIR,—I have been reading Mr Maskelyne's article on exhibition judging with some interest as I frequently have to judge the locomotive models at the Rand Society of Model Engineer's annual show, of which, incidently, I am the secretary this year. Our points for awards are somewhat different from yours, but I want to get the committee to modify them as I do not agree with some of them.

There is one point in Mr Maskelyne's list which does not seem altogether fair to me, and that is "Fidelity." It seems that he is penalising the freelance model too heavily. I admit that there is no prototype to which it can be compared, but it can be compared to prototype *practice* or general engineering practice.

It has been said that a freelance model can be anything and still cannot be penalised since the builder designed

it so, but I do not agree with this and a freelance job which complies with scale standard practice or accepted practice should get some marks under Fidelity. I would prefer to see this point given the title "Fidelity to Accepted or Standard Full Size Practice." This would still apply to the prototype model and would not penalise the freelance locomotive or model.

Since the prototype model can only get half under Design and Originality, it could be evened up by making half marks available to the freelance under Fidelity.

Maybe there is an argument against this idea; if so, I am open to conviction, but I would appreciate any comments, since they will assist us in judging at our exhibition.

The system of marking which I am trying to introduce for our society is as follows: *1* scale accuracy, 15; *2* suitability of material, 10; *3* general workmanship, 25; *4* painting and surface finish, 25; *6* general merit (presentation, etc.), 10; *7* quantity of work relative to section, 10; and *8* quantity of work relative to all models, 10. Total: 105.

Item eight needs some explaining. We receive a gold medal from the Rand Agricultural Society each year for the best model irrespective of section, and since we have locomotives, ships, aeroplanes and general we have to take this item into consideration. If we had a gold medal for each section it would, of course, fall away.

A competitor has to have 85 marks or over to qualify for a gold medal. We have twice had two models which we could not separate and on both occasions the Agricultural Society has awarded each a gold medal. The first time was for Mr L. Ellison's model of HMS *Birmingham*, and Mr Peache's model of *Cutty Sark*. Both were so perfect that we called in the manager of the RAS and asked his opinion. He did not hesitate. Each got a gold medal.

The second time was this year when the medals were won by Mr H. Sanders' Thames barge *Redoubtable* and a model of an army lorry by a Mr G. W. van Asperen.

There have also been occasions when no gold medal was awarded since we did not think any models worthy of it.

One more item: is the series "Locomotives I Have Known" going to be published in book form? I sincerely hope so: they are too valuable to be allowed to dispapear with the passage of time.

D. F. HOLLAND.

J.N.M. writes: *In our system, the term "Fidelity" covers* fidelity to prototype *only, i.e. the accuracy of the model as such. This cannot apply to an* original *design prepared by a competitor prior to the construction of his model.*

To take care of the very qualities that Mr Holland mentions is exactly the reason for the deliberate introduction of a considerable elasticity of marking under the heading "Design and Originality." This not only automatically covers the application of standard full-size practice, but it also takes care of cases in which the designer-builder may adopt some original principles according to his own ideas. They may be good, or bad.—EDITOR.

LOCATING DEVICE

SIR,—I thank you for accepting my idea for a die holder locating device [ME, September 5], but I wish to inform you of an error in my drawing

Mr Blake's amended drawing for his die holder locating device. Note the locating spigot at end

which will greatly effect the use of the device.

If you compare the accompanying illustration with my original drawing, you will notice that a spigot is formed on the flange. This spigot locates the die holder and prevents it from rocking.

Gosport, Hants. WILLIAM H. G. BLAKE.

18 pdr AND 75 mm. GUNS

SIR,—May I make three points in addition to the letters which have appeared on the subject of these guns?

First, the prototype 18 pdr appeared about 1905, which means that the RA committee and the Ordnance board started evolving the design immediately after the South African war. It differs in toto from private firms' designs of that period and, therefore, must have started virtually from scratch.

At that time our relations with the French were such that any Englishman who made inquiry into the mechanism of the 75 mm.—although byt hat time it was five years old—was apt to find himself clapped in "jug" and kept there.

Secondly, the two designs could not be more different. The 18 pdr had a tubular trail, spring recuperator above the gun (see Mr Walter's fine model) 4 deg. top traverse on a separate top carriage, and hand fuse setting. Also it was a bigger gun.

The 75 mm. had a box trail, hydropneumatic recoil gear *beneath* the gun, a system of axle traverse (on a curved axle in some marks) to give about the same sweep as the 18 pdr, and a mechanical fuze setter.

Thirdly—and lastly, dear brethren—the designers were aiming at two different things. The 75 mm. was intended for a war against Germany, where it would never be far from a railhead or a base depot: and its—for those days—complicated recoil and run-out gear, should it fail, was meant to be whipped straight out, sent back to the workshops for overhaul, and a spare substituted.

It may be difficult to believe, today, but no one in England was then thinking in terms of a world war. We had a Navy and that was that. The RA committee wanted a gun which, while suitable for war on the Continent, could be kept in action by simple means far from railhead or base workshops with the tools available to battery or artificers.

I spent three years at the Ecole Militaire d'Artillerie, Fontainebleau, in addition to commanding 18 pdr batteries, so that I have had perhaps exceptional opportunities of studying both guns.

D. J. R. RICHARDS
(Brigadier, late RA).

CALLING SECRETARIES

SIR,—For some time we have been negotiating with the Development Corporation of Harlow New Town for an allocation of space in the park for a locomotive track and also a pond suitable for all types of model sailing. With the transfer of the town affairs to the new UDC there has been a break in the negotiations with the loss of much data originally submitted to lend weight to our request.

We are now opening negotiations with the UDC and in order to make out the best possible case we should welcome any information from secretaries indicating the extent of co-operation by local councils and actual assistance in the supply of labour and materials. Photographs would be most helpful too and would be returned as soon as possible.

Despite the demands made by new houses and new gardens our little society is quite healthy. Locomotives at present under construction include *P. V. Baker*, *Netta*, *Virginia*, *Maisie*, *Tich*, *Doris* and *Butch* as a communal effort.

Harlow, Essex. J. W. NOBLE
(Sec., Harlow and District SME).

Do not forget the query coupon on the last page of this issue

READERS' QUERIES

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20 Noel Street, London, W1.

Lathe building

I am building a 5 in. lathe, but would be grateful if you will supply answers to the following questions:

1 The rack wheel is 12 d.p. and has 18 teeth. What is the correct spacing for the rack teeth ?

2 Will a straight-sided tooth of 29 deg. inclusive be suitable ?

3 Should the teeth and spaces be of equal size ?—P.L.R., Scunthorpe, Lincs.

▲ 1 *The circular pitch of* 12 *d.p. gears is* 0.2618 *in. measured circumferentially on the pitch line, and this will be the correct spacing for teeth in a straight rack. The depth of the tooth for* 12 *d.p. gears is* 0.1875 *in.*

2 *A straight-sided tooth of* 29 *deg. included angle will be correct for the rack.*

3 *The teeth and spaces should be equal in dimensions on the pitch line, which can be taken as half the tooth depth—though to be perfectly accurate it should be very slightly above this.*

Incidentally, you would find it easier —in view of the fact that a lathe is available—to machine-cut the teeth in the rack. This could be done relatively simply by using an inserted tooth cutter and using the leadscrew with a suitable index for accurate measurement of the tooth spaces.

Steel rail ?

Could you please give me the name and address of a supplier of steel rail, F.B. or B.H., for 2½ in. gauge ?—W.S.C., London, SW1.

▲ *It is very much doubted whether steel rail for* 2½ *in. gauge is now available anywhere. However, Fenlow Products Ltd, Weybridge, Surrey, produce light alloy scale rail in all sizes from O gauge to* 7¼ *in. gauge—in both bull-head and flat bottom section. This is now very popular and quite satisfactory in that it lasts a long time and can be easily painted to look like full-size rail if necessary.*

The only disadvantage is that this aluminium alloy rail in damp weather is as slippery as brass.

Matt finish

During my visit to the Model Engineer Exhibition I was very impressed by the matt finish in various colours on some of the model locomotives, which did not appear to be painted on.

Could you give me any information on how this finish is produced on ferrous and non-ferrous metals, and any article or book dealing with the subject ?—R.P., Kimberley, Notts.

▲ *This particular matt finish is best obtained by spraying with a semi-matt paint. Almost any model railway dealer today can supply these paints in all colours, and the Percival Marshall handbook "Painting and Lining Models" contains all the information you will require on the subject.*

Radius curve

I am constructing a model of *Maisie* to LBSC's words and music. Could you advise me as to the minimum radius curve this locomotive will negotiate, as I cannot obtain a continuous track in my garden with curves a larger radius than 15 or 16 ft. Would a radial axlebox arrangement on the trailing wheels of the locomotive be feasible ?—J.H.M., Sidcup, Kent.

▲ *You should have no difficulty in persuading* MAISIE *to run round a* 15 ft *radius curve. This engine's* 4-4-2 *wheel arrangement should easily allow it to negotiate such a curve, though you are recommended to leave as much side play as possible in the trailing wheels. There is no real necessity to go to the trouble of fitting radial axleboxes.*

Piston and valve rods

I am building a 3½ in. gauge L and Y 2-4-2 tank engine, which is a combination of *Molly* and *Miss Ten to Eight*. Can you tell me how the piston rods and valve rods are fixed into the crossheads? The drawings simply show plain unscrewed rod ends and a reamed hole.—H.A.H., Doncaster.

▲ *The fixing of the piston rods and valve rods into the crossheads is usually made by a flat cotter or a tapered pin, the latter probably being the simpler one for most people.*

Lapping gunmetal

I am making a traction engine, and there is a gunmetal casting for the cylinder—the bore and stroke to be ½ in. × ¾ in. I have read that gunmetal should not be lapped with emery cloth as the final procedure, though seemingly a bit of emery cloth wrapped around a stick produces a perfect finish with a cast-iron cylinder. This seems so simple that I should like to do it on my cylinder. Could you tell me whether this will be in order ?

If not, what should be done after the final cut with the boring tool ?—R.B.L., Northwood, Middx.

▲ *Although it is not advisable to lap gunmetal cylinders with emery cloth, the process may be quite safe provided that, after lapping, the bores are thoroughly washed out with paraffin.*

An alternative would be to lap the cylinders with some abrasive metal polish like Brasso, but again a thorough wash out of paraffin is necessary afterwards. By far the best and safest method, however, is to use a reamer for finishing the bores.

Allen valve gear

I hope soon to be starting on the construction of a 5 in. gauge version of the Festiniog Railway locomotive *Princess*. The original engine is fitted with straight link valve gear—Allen type—and I am wondering how to determine the lengths of the eccentric rods, valve rods and expansion link, and reversing shaft arms for lifting the valve rod and expansion link. Can you recommend any books on the subject, please ?—F.N.M., Upminster, Essex.

▲ *The only source of information regarding Allen straight link valve gear appears to be in old books dealing with valves and valve gears. Several such books have been published in the past, and you might possibly be able to obtain one through Foyles, of Charing Cross Road.*

The alternative would be to obtain the particulars from the actual engine or from the original drawings, if they can be obtained.

CLUB NEWS

EDITED BY THE CLUBMAN

NOT everyone who enjoyed the thrills of watching diesel cars on the North London SME track at the Model Engineer Exhibition knew that the North London society was a pioneer in model-car racing. It can in fact claim to have more experience of this sport than any other club in Britain.

From a Z-track of the kind used in America years ago, North London progressed to tubular rail and then to its present system. It was, I believe, Mrs Ernest Rhodes who had the bright idea of incorporating a feature of the original track: the use of clips, instead of fishplates, for joining-up.

In all aspects of model engineering the North London society shows the same pleasant vigour and initiative. Much hard work, for instance, has gone into the extension of the live steam track to 1,500 ft. The line is constructed in concrete with timber sleepers and steel rails, and every bit of it was fashioned at the Arkley Barnet headquarters where a four-ton flywheel (it just happened to be there) provides a kind of symbolic centrepiece to all the activity in progress.

Among the locomotives finished or under construction you will see *Netta*, *Maid of Kent*, *Minx*, *Juliet*, *Molly*, *Pamela*, *Maisie*, *Tich*, *Fayette*, a *Britannia* and a 5 in. *George V* which chairman Geoffrey Cashmore has based very largely on *Maid of Kent*. Clyde Austin's *Netta* shows what can be done by a man with only one arm.

Many readers will have seen the Cochran boiler on the society's excellent stand at the Exhibition. This, of course, is to provide a central supply of steam. At first the live steamers were almost set on building a Babcock. They then considered a Cochran boiler and Cochran's were kind enough to send the drawings.

Nippy's the word !

Regatta-goers are well acquainted with the achievements of North London's marine section. At St Albans this year Cecil Drayson came second in the nomination class with an error of only 0.3 sec., the winner having no error at all. After thirty years Mr Drayson's *Nippy II* can still make off with three prizes at St Albans !

Donald Gordon has been working this year on a 20 in. steam launch. He is a disciple of A. A. (Dot) Sherwood, who sent us, all the way from Australia, the "smallest locomotive in the world."

The OO layout is a great attraction for younger members, boys of thirteen or fourteen like Roger Bugg and Roger Grant. At the other extreme we find Alfred Pinnock still happily busy at 84. Mr Pinnock can do wonders with old tinplate.

You will have gathered, even from this quick glance, that the only thing which doesn't spin at Arkley Barnet is the four-ton flywheel ! And if you want to join, as some of you will, you can set about it now by dropping a line to secretary Donald Gordon at 60 Victoria Road, New Barnet, Herts. For those in a hurry the telephone number is Bar 3180.

BRING YOUR LOCOS

Near Warrington and Newton-le-Willows, in the Robert Stephenson country, **Warrington MES** has its locomotive track for passenger-carrying.

The place is Earlstown, and locomotive men from other clubs are invited there for the track day on October 19 when they can try out their engines of 3½ in. and 5 in. gauges on the new 530 ft continuous line.

Readers who intend to be there are asked to communicate with secretary T. B. Stamp at 9 Crossfield, Drive, Worsley, Walkden, Manchester (Walkden 3342).

FIGHTING BANTAM COCK

There is more good news from the North. **West Hartlepool SME** has been participating again in local events and work is going ahead on its permanent track, to be opened, if all goes well, next year.

More than 400 passengers rode on the club's portable track at the annual show of West Hartlepool's Gardens Guild—all hauled by a single 3½ in. *Bantam Cock*, "a tribute, I think," writes C. H. Cheshire, "to LBSC's design and the workmanship of J. Stephenson, its builder and driver."

The club had the pleasure of congratulating John Snowden on securing first prize at the **IRCMS** contest in Saltwell Park, Gateshead. John also did the trick last year, you may recall.

Members will soon have to quit their present club rooms but they have hopes of permanent headquarters later and in the interval are using temporary accommodation.

Secretary A. C. Lamb may be found at 9 Brus Corner, West View, Hartlepool, Co. Durham.

THAT RALLY

I have no news as yet of the rally for steam cars which the **British Light Steam Power Society** was proposing to hold this month. Just to show what a steam car could do, H. Claydon drove up in one from Brighton when the society held its annual meeting this year at the Caxton Hall in London.

At the same meeting members discussed a proposed steam generator for i.c. conversion and heard a report by Alec Hodsdon on the steam car which he was building—a Lancia Lambda having a two-cylinder compound engine designed by the society with a monotube steam generator. After many trials and tribulations the car was then nearly complete and was expected to be running in September at a rally where steam cars would be demonstrated.

Secretary Robert G. Davis lives at Linden, 309 Arundel Street, Portsmouth. Other officials are Lt-Col A. G. Steele, president; Thomas Hindle, vice-president; M. Harman Lewis, chairman; and A. E. Newbery, *pro-tem.* treasurer. Edgar T. Westbury has joined the technical committee.

ME DIARY

September 26 Southport M and EC annual exhibition, Chapel Street Congregational schoolroom (Sept. 26-28).
September 27 North London SME locomotive section, HQ, 8 p.m.
September 28 REC Sallins-Tullow rail-tour ends.
Southport show last day.
September 29 Portsmouth MPBA regatta (Southampton).
Southend MPBC regatta, 2.30 p.m.
Chingford and District MEC at Ridgeway Park.
October 4 Rochdale SMEE cine show, W. F. Jackson, Lea Hall, 7.30 p.m.
North London SME at ER Gas Offices, New Barnet, 8 p.m.
October 5 REC auto-train tour of mineral and other lines in Guildford, Aldershot and Reading areas.
JIE film evening 7 p.m.
York show ends.
October 8 JIE membership committee 6.15 p.m.
October 12 JIE paper "The Problem of O and M Study," W. J. Kease, 7 p.m.
October 13 IRCMS at Kingsley Hotel, London.
October 16 Chester MRC sixth annual exhibition, Chester Town Hall (October, 16-19).
October 18 Birmingham SMS "A Doctor Afloat," Dr Stanley Wood, Imperial Hotel, Temple Street, Birmingham, 7.30 p.m.
October 19 Warrington MES track day, Earlstown near Warrington.
Chester show ends.

Model Engineer

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U.S.A. Porter Cable BK 10″ Speedmatic portable saw, 1″ × 10″ blade, 2″ × 9″ blades, 2″ × 9″ carb. discs. Strong steel carrying case. Under one hour's use, £25. —Box No. 8618, MODEL ENGINEER Offices.

12″ Circular Saw Spindle, dustproof ballbearings, pulley, flanges, unused, 62s. 6d. C.P.—Box No. 8619, MODEL ENGINEER Offices.

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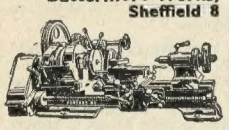

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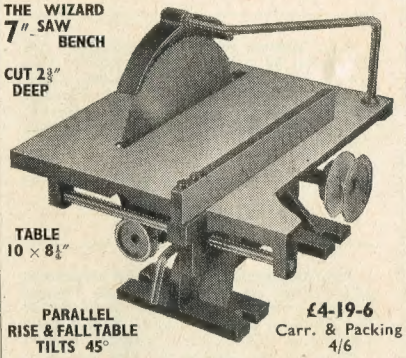

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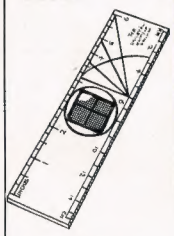

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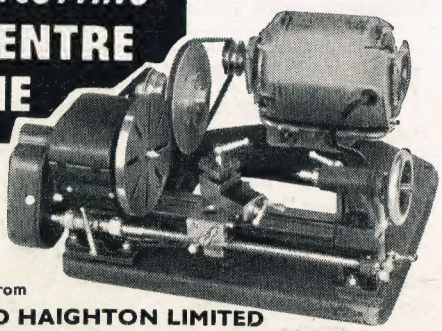

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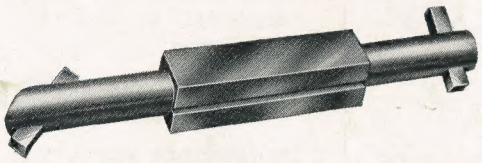

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1845	$\frac{3}{4}$" × 9"	$\frac{5}{16}$" sq.	1" × 3$\frac{3}{4}$"	21/32"	£1 10 9
1846	$\frac{11}{16}$" × 11$\frac{1}{4}$"	$\frac{3}{8}$" sq.	1$\frac{1}{2}$" × 4$\frac{1}{2}$"	3/4"	£2 3 3
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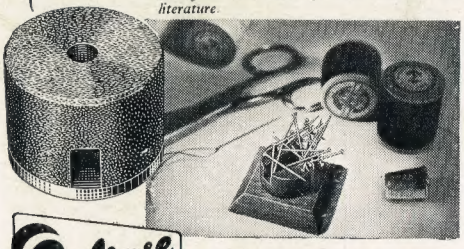

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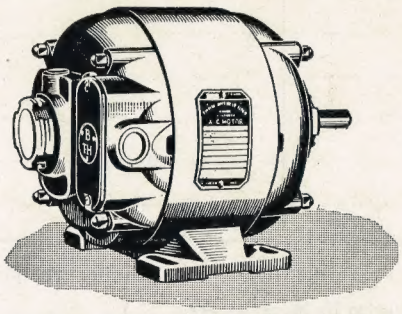

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